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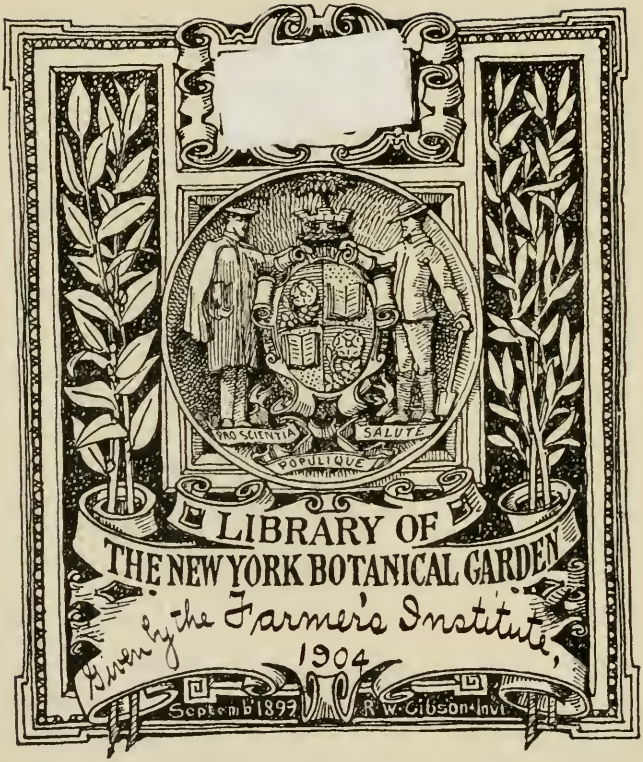
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INSTITUTE BULLETIN NO. 6 JUNE, 1900

MICHIGAN

STATE

FARMERS' INSTITUTES

WINTER OF 1899-1900

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CLINTON D. SMITH, M. S., - - Agricultural College, Michigan

MAY 2 1904

LETTER OF TRANSMITTAL.

To the State Board of Agriculture:

Gentlemen—I have the honor to transmit herewith a report of the Institute work carried on under your direction during the year closing June 30th, 1900. The report will include:

The law authorizing the holding of the Institutes, and providing funds therefor;

The financial statement showing the expenditures of the fund;

A condensed report of the proceedings of the State Round-up Institute at Ann Arbor;

Tabulated statements concerning the County Two-day Institutes;

Tabulated statements concerning the One-day Institutes.

I respectfully recommend that this report be printed, as authorized by Section 6 of the act below.

Respectfully submitted,

CLINTON D. SMITH,

Superintendent Farmers' Institutes.

AGRICULTURAL COLLEGE, *Mich., June 30, 1900.*

The Law Authorizing the Holding of Farmers' Institutes, and Providing Funds Therefor. No. 137. Public Acts of 1899.

An Act to authorize the State Board of Agriculture to hold Institutes and to establish and maintain courses of reading and lectures for the instruction of citizens of this State in the various branches of agriculture, mechanic arts, domestic economy, and the sciences relating thereto, and making an appropriation therefor for the fiscal years ending June thirty, nineteen hundred, and June thirty, nineteen hundred one, and to provide a tax to meet the same.

The People of the State of Michigan enact:

Section 1. That the State Board of Agriculture is hereby authorized to hold Institutes and to establish and maintain courses of reading and lectures for the instruction of citizens of this State in the various branches of agriculture, mechanic arts, domestic economy, and the sciences relating thereto. The said Board shall formulate such rules and regulations as it shall deem proper to carry on the work contemplated in this act, and may employ such agent or agents to perform such duties in connection therewith as it shall deem best.

Sec. 2. In each county where an Institute Society shall be organized and maintained under the provisions of this act, the State Board of Agriculture shall annually hold at least one Institute of at least two days in length. When twenty or more persons, residents of any county in this State, shall organize themselves into a society to be called the ..... County Farmers' Institute Society, for the purpose of carrying out the objects of this act, and in accordance with rules and regulations furnished by the State Board of Agriculture, such society shall be deemed an Institute Society in the meaning of this act: Provided, That not more than one such Institute Society in any county shall be authorized by this act. The State Board of Agriculture shall hold One-day Institutes in such counties of the State as it may deem expedient, but not to exceed four annually in any one county. The State Board of Agriculture may also hold, at such places and times as it may determine, special Institutes, at which the primary object shall be to furnish a school of instruction in the lines specified in section one of this act.

Sec. 3. For the purposes mentioned in the preceding section, the State Board of Agriculture may use such sum as it shall deem proper, not exceeding the sum of five thousand five hundred dollars, in the year ending June thirty, nineteen hundred, and five thousand five hundred dollars in the year ending June thirty, nineteen hundred one: Provided, That two hundred dollars of this appropriation shall be available before June thirty, eighteen hundred ninety-nine.

Sec. 4. The several sums appropriated by the provisions of this act shall be paid out of the general fund in the State Treasury to the Treasurer of the State Board of Agriculture, at such times and in such amounts as the general accounting laws of the State prescribe, and the disbursing officer shall render his accounts to the Auditor General thereunder.

Sec. 5. The Auditor General shall incorporate in the State tax for the year eighteen hundred ninety-nine the sum of five thousand five hundred dollars, and for the year nineteen hundred the sum of five thousand five hundred dollars, which, when collected, shall be credited to the general fund to reimburse the same for the moneys hereby appropriated.

Sec. 6. The State Board of Agriculture is further authorized to publish an annual report, to be known as the "Farmers' Institute Bulletin," of not to exceed two hundred fifty pages, which shall contain, besides statistical reports of the work done and expenditures incurred under this act, such addresses and discussions occurring at the meetings held under this act, as the Board of Agriculture shall deem of sufficient interest to warrant publication. The Board of State Auditors is hereby directed to print such report and to cause it to be bound in substantial binding, in the same manner as other reports are printed and bound, and in number sufficient to furnish one to each member of each County Farmers' Institute Society organized under this act, and not to exceed one thousand five hundred in addition for general distribution by the Board of Agriculture. The Secretary of State is hereby directed to ship by freight to the Secretary of each regularly organized County Farmers' Institute Society a sufficient number of copies of said report to supply one to each member of such County Society.

Sec. 7. The Board of Agriculture, the Board of State Auditors, and the Secretary of State are hereby authorized and directed to publish, print, bind and distribute a similar report for the year ending June thirtieth, eighteen hundred ninety-nine, as provided in section 4, for future reports under this act.

This act is ordered to take immediate effect.

Approved June one, eighteen hundred ninety-nine.

FINANCIAL STATEMENT.

EXHIBITING THE EXPENDITURES OF THE FUND APPROPRIATED BY ACT 137 OF PUBLIC ACTS OF 1899.

Appropriation			$5,500 00

EXPENDITURES.

For bills accruing prior to June 30, 1899		$200 27	
For Institutes during the year ending June 30, 1900		5,299 73	
			5,500 00
Salaries	$2,689 05		
Travel	2,397 17		
Printing	78 67		
Postage	148 68		
Freight	9 66		
Sundry	102 82		
Farm Home Reading Circle	73 95		
	$5,500 00		5,500 00

DETAILED CLASSIFICATION.

Salaries—			
Speakers at two-day Institutes	$1,216 00		
Speakers at one-day Institutes	289 50		
Speakers at Round-up Institute	126 00		
Administration and office	897 28		
Salaries prior to June 30, 1899	160 27		
		$2,689 05	
Travel—			
Speakers at two-day Institutes	$1,650 45		
Speakers at one-day Institutes	360 64		
Round-up and travel of Superintendent	386 08		
		2,397 17	
Printing		78 67	
Postage		148 68	
Freight		9 66	
Sundry—			
Prizes offered in 1899	$40 00		
Sundry bills in 1900	62 82		
		102 82	
Farm Home Reading Circle—			
Printing new circular	$63 50		
Postage	10 45		
		73 95	
			5,500 00

DONATIONS BY RAILROADS.

Passes to Superintendent,		
65,000 miles traveled by workers to Institutes exclusive of Round-up, at half fare	$975 00	
Workers and delegates to Round-up, at half fare	225 00	
		1,200 00

FIFTH ANNUAL ROUND-UP FARMERS' INSTITUTE.

Accepting the invitation of the Farmers' Institute Society of Washtenaw county, the State Board of Agriculture held the Fifth Annual State Round-up Institute at Ann Arbor, February 27 and 28 and March 1 and 2, 1900.

The County Society, aided by the business men of the city of Ann Arbor, and by the President and other officers of the University of Michigan, had made all possible preparations for the meeting, both by extensive advertising and by setting aside suitable halls at the University, wherein the meetings were to take place. The railroads made a half fare rate from all points in the State.

The business men of Ann Arbor printed a beautiful souvenir program, with illustrations of the University buildings and points of interest about the city.

The State Board of Agriculture extended a very urgent invitation to county Secretaries and other officers of the County Institute Societies to attend the conference of delegates and workers and the sessions of the Round-up Institute itself. I am glad to report that forty-two out of the sixty-six counties having organized Institute Societies responded to this invitation by sending at least one delegate, and often more than one.

OFFICIAL DELEGATES TO STATE ROUND-UP INSTITUTE FROM COUNTY SOCIETIES.

County.	Name.	Address.	Office.
Allegan	T. G. Adams	Shelbyville	President.
Alpena	E. H. Toland	Ossineke	Secretary.
Barry	W. R. Harper	Middleville	Secretary.
Bay	Wm. Gaffney	Colfax	Secretary.
Benzie	Thomas B. Pettit	Benzonia	President.
Branch	E. E. Lewis	Coldwater	Secretary.
Calhoun	Lillian M. Adams	Battle Creek	Secretary.
Cass	J. G. Hayden	Cassopolis	President.
	John Dunning	Cassopolis	Secretary.
Clare	A. R. Canfield	Clare	Secretary.
Eaton	Geo. A. Perry	Charlotte	Secretary.
Emmet	E. A. Botsford	Petoskey	Secretary.
Grand Traverse	E. O. Ladd	Old Mission	Secretary.
Gratiot	Newton Burns	Ithaca	President.
Hillsdale	N. I. Moore	Moscow	Secretary.
Huron	T. A. Ramsay	Harbor Beach	Secretary.
Ingham	H. M. Young	Mason	Secretary.
Ionia	C. A. Preston	Ionia	Secretary.
Isabella	M. E. Kane	Mt. Pleasant	Secretary.
Jackson	J. W. Hutchins	Hanover	President.
Lapeer	C. A. Bullock	Hadley	President.
	F. E. Odell	Metamora	Secretary.
Lenawee	A. B. Graham	Adrian	Secretary.
Livingston	Benj. F. Bachelder	Howell	President.
	R. C. Reed	Howell	Secretary.

OFFICIAL DELEGATES TO STATE ROUND-UP INSTITUTE.—*Concluded.*

County.	Name.	Address.	Office.
Macomb	Frank D. Wells	Rochester	Secretary.
Manistee	J. H. Read	Pomona	Secretary.
Mason	S. A. Louden	Scottville	Secretary.
Mecosta	C. F. Kiefer	Borland	Secretary.
Monroe	John Nichols	Ida	Secretary.
Montcalm	F. S. King	Coral	Secretary.
Muskegon	J. H. Whitney	Muskegon Heights	Secretary.
Newaygo	W. C. Stuart	Fremont	Secretary.
Oakland	G. M. Campbell	Big Beaver	Secretary.
Oceana	C. F. Hale	Shelby	Secretary.
Ogemaw	Mrs. Cora L. Tolman	West Branch	Secretary.
Oscoda	Chas. V. Kittle	Spoar	President.
Ottawa	J. A. Avery	Forest Grove	Secretary.
Saginaw	J. A. Slocum	Saginaw, W. S.	Secretary.
St. Clair	C. S. King	Port Huron	President.
	James Dunn	Emmett	Secretary.
St. Joseph	George Engle	Centerville	President.
	E. L. Snyder	Centerville	Secretary.
Sanilac	S. Bricker	Brown City	Secretary.
Shiawassee	J. J. Wheelan	Vernon	Secretary.
Tuscola	J. W. Murphy	Cass City	Secretary.
Wayne	P. B. Whitbeck	Plymouth	Secretary.

The proceedings of these conferences were technical and related exclusively to matters connected with the Institutes to be held in the winter of 1900-1901. An advance step of no inconsiderable importance was the grouping of counties of allied and similar interests in such a way as to economize the time of the workers and expense of railroad fare and hotel.

The weather on Tuesday, February 27th, left nothing to be desired. During the night of Tuesday and all day Wednesday a heavy snow storm prevailed, blocking alike the railroads and the street cars. Wednesday evening a regular blizzard prevailed, and trains were not running regularly until Friday. This snow storm decreased the attendance of the Institute very materially and caused a re-arrangement of the program for Thursday and Friday, March 1 and 2.

The day sessions were held in Newberry Hall, the general sessions on the second floor in the large auditorium, and the Women's Section and the sugar beet conference in the large parlors on the first floor. The evening sessions were held in the University chapel, an immense auditorium seating several thousand persons. All these rooms were faultlessly heated, lighted and ventilated, and nothing was lacking either in the way of hall room or other conveniences to make the Institute a success. The President and Faculty of the University extended to the visiting delegates a very cordial invitation to inspect the buildings and grounds of that great institution, an invitation that was very generally accepted.

There must be mentioned as a necessary part of the history of this Round-up Institute the very efficient, self-sacrificing and unremitting labor of the officers of the Washtenaw County Institute Society, especially its Secretary, and the equally unremitting attention of the President, Secretary and other officers of the University, who left nothing undone that would minister to the comfort of visitors or the success of the Institute.

The program, addresses and discussions at the Institute follow:

FIFTH ANNUAL

MICHIGAN STATE FARMERS' INSTITUTE,

HELD AT

ANN ARBOR, WASHTENAW COUNTY,

FEBRUARY 27 AND 28 AND MARCH 1 AND 2, 1900,

UNDER THE JOINT AUSPICES OF THE

WASHTENAW COUNTY FARMERS' INSTITUTE SOCIETY AND THE STATE BOARD OF AGRICULTURE.

PROGRAM.

TUESDAY, FEBRUARY 27.

AFTERNOON.

NEWBERRY HALL.

TOPIC—THE SOIL.

1:30 From the Chemist's Standpoint.—Dr. R. C. Kedzie, Agricultural College.
2:00 As the Bacteriologist Sees It.—Prof. C. E. Marshall, Agricultural College.
2:30 Maintaining Fertility With Green Manures.—Prof. J. D. Towar, Agricultural College.
3:00 Soil Physics.—Prof. J. A. Jeffery, Agricultural College.
3:30 Tillage in Theory and Practice.—Roland Morrill, Benton Harbor.
4:00 General discussion of soil questions.

TUESDAY EVENING.

UNIVERSITY HALL.

TOPIC—HIGHER EDUCATION.

7:00 Music.—University Glee Club.
7:30 At the University.—Dr. James B. Angell, Ann Arbor.
8:00 At the State Normal Schools.—Dr. Albert E. Leonard, Ypsilanti.
8:20 At the Agricultural College.—Dr. J. L. Snyder, Agricultural College.
Music.—University Glee Club.

AS IT APPEARS TO THE BOARDS OF CONTROL:

8:40 Of the University.—Col. H. S. Dean, Ann Arbor.
9:00 Of the Normal Schools.—Prof. F. E. Johnson, Ann Arbor.
9:20 Of the Agricultural College.—Capt. E. P. Allen, Ypsilanti.
Music.

WEDNESDAY FORENOON, FEBRUARY 28.

NEWBERRY HALL.

8:00 Conference of county delegates.

TOPIC—FARM CROPS.

9:00 Question box.
9:30 Lessons of the Year in Wheat Growing.—A. M. Brown, Schoolcraft.
9:40 Discussion.
10:00 Lessons of the Year in Growing Corn.—E. A. Croman, Grass Lake.
10:20 Discussion.
10:30 Results of Experiments With Legumes.—Prof. J. D. Towar, Agricultural College.
10:40 Discussion.
11:00 Rotation of Crops.—A. E. Palmer, Kalkaska.
11:20 Discussion.
11:30 New Helps in Potato Growing.—M. L. Dean, Agricultural College.

WEDNESDAY AFTERNOON.

NEWBERRY HALL.

TOPIC—FRUIT.

1:00 Question box.
1:30 The New Time Ideas in Fruit Growing.—Prof. L. H. Bailey, Cornell University, Ithaca, N. Y.
2:15 Discussion.
2:30 Lessons of the Year in Peach Growing.—Roland Morrill
3:00 Present and Future of Michigan Apples.—S. H. Fulton, South Haven.
3:30 New Thoughts on Small Fruits.—J. N. Stearns, Kalamazoo.
4:00 Insecticides, Fungicides and Spraying.—Prof. L. R. Taft, Agricultural College.

WEDNESDAY EVENING.

UNIVERSITY HALL.

Music under the direction of A. A. Stanley, A. M., U. of M.
7:00 Liquid Air.—Paul C. Freer, Ph. D., M. D., U. of M.
This lecture in Dr. Freer's lecture room, using the only liquid air machine between New York and San Francisco.
8:00 The Trend of Agricultural Education.—Prof. L. H. Bailey.
9:00 Importance of Co-operation in Education.—Robt. M. Wenley, Sc. D., D. Phil., U. of M.

THURSDAY FORENOON, MARCH 1.

NEWBERRY HALL.

8:00 Conference of county delegates.
8:45 Visit to the University and State Normal College at Ypsilanti.
8:45 Conference of beet sugar manufacturers with Dr. H. W. Wiley, Chief Chemist, Department of Agriculture, Washington, D. C.

THURSDAY AFTERNOON.

NEWBERRY HALL.

TOPIC—SUGAR BEETS.

1:15 New Solutions to Old Soil Problems.—L. H. Bailey.
2:30 Lessons of the Year in Sugar Production.—Dr. H. W. Wiley.
3:30 Questions and discussions.

THURSDAY EVENING.

UNIVERSITY HALL.

Music by the University Glee and Mandolin Clubs.
7:30 Farmers' Organizations:
Farmers' Clubs.—A. N. Kimmis, Midland.
The Grange.—Geo. B. Horton, Fruit Ridge.
8:10 The Farmer as a Business Man.—A. C. Bird, Agricultural College.
Music.
8:40 The Farmer as a Citizen.—Hon. Cyrus G. Luce, Coldwater.
9:10 The Manufacture of Sugar from Beets.—Dr. H. W. Wiley, Washington, D. C. (Illustrated by stereopticon.)

FRIDAY FORENOON.

NEWBERRY HALL.

8:00 Conference of county delegates.

TOPIC—CATTLE AND SWINE.

9:00 Up-to-date Care of the Dairy Cow.—J. W. Hutchins, Hanover.
9:30 General discussion of Dairy Topics.
9:50 The Importance of Type in Profitable Steer Feeding.—Prof. H. W. Mumford, Agricultural College.
10:10 Silage for Fattening Steers.—John S. Gilbert, Harbor Beach.
10:30 Feeding Steers Without Silage.—Wm. Ball, Hamburg.
10:50 Discussion of cattle feeding.
11:00 What Style of Hog Do the Present Markets Demand?
The Bacon Hog.—J. J. Ferguson, Agricultural College.
The Packer's Choice.—E. A. Croman, Grass Lake.
11:30 Business meeting of the Washtenaw County Farmers' Institute Society.

FRIDAY AFTERNOON.

NEWBERRY HALL.

TOPIC—SHEEP AND HORSES.

1:00 Question box.
1:20 Up-to-date Lamb Feeding.—A. M. Welch, Ionia.
1:40 Breeding Fine Wools.—Peter Voorheis, Pontiac.
2:00 Early Lambs.—L. W. Oviatt, North Williams.
2:20 Sheep Raising on the Diversified Farm.—A. B. Cook, Owosso.
2:40 The Possibilities and Essentials of Horse Breeding in Michigan.—Robert Gibbons, Detroit.
3:10 What Type of Horse Shall the Michigan Farmer Breed?—Prof. H. W. Mumford.
3:30 Suggestions as to Some of the Recent Diseases of Live Stock and Remedies.—Dr. G. A. Waterman, Agricultural College.

WOMEN'S SECTION.

PARLORS OF NEWBERRY HALL.

TUESDAY AFTERNOON, FEBRUARY 27.

1:30 Habit and Manners.—Miss Maud R. Keller, Agricultural College.
2:00 Discussion.
2:30 Instruction in Plain Sewing in the Home.—Mrs. J. L. K. Haner, Agricultural College.
3:00 Discussion.
3:30 School Hygiene.—Dr. Eliza Mosher, Ann Arbor.
4:00 Discussion.

WEDNESDAY AFTERNOON, FEBRUARY 28.

1:30 Well Bred Children.—Mrs. Mary A. Mayo, Battle Creek.
2:00 Discussion.
2:30 The Relation of Good Cooking to the Health of the Family.—Miss Belle Crowe, Agricultural College.
3:00 Discussion.
3:30 Address by Miss Julia A. King, Normal College.
4:00 Discussion.

THURSDAY AFTERNOON, MARCH 1.

Visit to the Museum, Art Gallery and to the Gymnasium as the guests of Dr. Mosher.

REPORT OF THE STATE INSTITUTE.

TUESDAY AFTERNOON.

Mr. Wm. Campbell, the President of the Washtenaw County Farmers' Institute Society, presided at this session. In the name of the business men of Ann Arbor, and in behalf of the University and the farmers of Washtenaw county, he extended a hearty welcome to the visiting delegates from other counties and to the officers and speakers of the Agricultural College and the State Institute.

The topic of the afternoon was "The Soil," to be considered from various standpoints.

THE SOIL—FROM THE CHEMIST'S STANDPOINT.

DR. R. C. KEDZIE, AGRICULTURAL COLLEGE, MICH.

First he looks down on it; then he looks into it.

Let me open my subject by a quotation from the leading agriculturist of this country. Prof. Johnson says: "Chemistry has proved that the soil is by no means the inert thing it appears to be. It is not a passive jumble of rock dust, out of which air and water extract the food of vegetation. It is not simply a stage on which the plant performs the drama of growth. It is, on the contrary, in itself the theater of ceaseless activities; the seat of perpetual and complicated changes."—*How Crops Feed*, page 331.

The chemical activity of the soil is the key to the soil problem. To these incessant changes the physical forces contribute; heat and cold, the splitting wedge of frost, and possibly in the final analysis we may find an agent in the electrical forces that "gird the earth as with a band."

Let us count up the elemental forces that wage this endless but silent warfare of nature, and line up our soldiers for inspection. Of the 70 elemental substances known to the chemist, and which make up the entire mass of the world, only 13 contribute to and enter into farm crops, and have been called the "Chemicals of Agriculture." Of these, four make the great mass of organic substances and come first or last from the air; while the nine remaining materials come entirely from the soil and constitute the ash or mineral residue when plants are burned. These mineral elements are distributed in widely varying

proportions in the earth. Thus silica, alone or in combination, makes up one-fourth part of the matter forming the rock-ribbed earth. Lime forms vast mountain chains, and is also found in every soil.

On the other hand, some of these chemicals of agriculture, while widely distributed, are found in only small amounts in soils. They are, however, of highest importance in agriculture, because no plant of any kind can grow in their absence, and the limited amount of these correspondingly limits all the other conditions of growth. Such are potash and phosphoric acid.

Let us see how much of these materials is contained in the alluvial soils of Michigan. In 38 soils, gathered from all parts of the Lower Peninsula and analyzed in the chemical laboratory, the average per cent of potash was found to be 1.11, and of phosphoric acid .28 per cent. An acre of soil, taken to the depth of one foot, containing 1.11 per cent of potash, would hold 46,400 pounds of potash and 11,700 pounds of phosphoric acid. The amount of these materials in bank, while relatively small, is absolutely large. Let us see how cropping may draw upon these deposits. Clover hay makes a heavy demand for potash, two tons containing 40 pounds, yet more than eleven hundred crops of such hay may be removed before the fund is exhausted, even if no part of the crop is returned to the soil.

The soil supply of potash is derived from the decomposition of rocks containing the silicate of potash, etc., e. g., feldspar, a silicate of potash and alumina containing 12 per cent of potash. Suppose we have a soil made up of half sand and half feldspar—a loam. These original soil materials would contain 250,920 pounds of potash. In the process of decomposition much of this potash would be set free in soluble condition and be washed away in drainage water. If four-fifths were thus removed, we would have 50,184 pounds left in the clay soil remaining. But the feldspar is very seldom completely decomposed, particles of feldspar remaining in the clay, the successive decomposition of which furnishes a supply of potash for untold ages. This is one reason for the strong and persistent quality of clay soils, especially the boulder clays of our western shore and some central countries.

Conceding the great agricultural value of potash as a manure, a practical question arises, How shall the farmer secure a sufficient supply? He may buy it in the market, as the German Kali Works offer the Stassfurt Salts, rich in potash, for sale; or he may raise potash by promoting decomposition of potash-bearing minerals in his soil, especially if his land has a fair amount of clay.

Soil materials may be placed in three general classes: Active, which are chemicals in condition for immediate use, soluble in water or easily dissolved by the acid juices of roots of plants; the amount of active material seldom exceeds one per cent: Reserve, not soluble or immediately available for plant use, and for the time simply discharging a mechanical office for the plant, but capable of becoming active by further decomposition, and thus gradually brought into the active class; not in active service now, but liable, like all reserve troops, to be drafted for active service. The first, or active class, we may call cash in hand; the reserve, as funds in the hands of a receiver, and liable to remain somewhat indefinitely in the hands of the receiver unless we demand an accounting. The third class includes the permanently insolu-

ble and inactive materials, which are of value to the plant by reason of their physical properties, relating to temperature, moisture and mechanical support of the plant; the mechanical agents of plant growth.

It is with the second, or reserve class, that the chemist has to do. How to bring the reserve elements of fertility into active use is the great problem of the agricultural chemist. This change is effected incidentally by a great many operations on the farm; plowing, harrowing, cultivating the soil, draining and tiling, opening up the soil to action of frost, weathering, etc. Anything which will physically modify the condition of the soil will have an incidental influence on the reserve bodies of the soil. Cultivation is not limited to killing weeds; it aids plant nutrition far more by promoting nitrification, for a well cultivated field is a nitre plantation on a large scale.

What I wish to emphasize is the maxim of Dr. Halsted: "The soil is a factory, not a mine." A mine is worked out and abandoned because exhausted. When the present crop of gold is gathered and the last glittering particle is secured, no new crop of gold again appears, even during the lapse of the slow-winged centuries, and the mine is closed forever. Not so the soil. It is a factory—the workshop of God, where his hand-maid, Nature, weaves in endless forms the wonderful fabrics of vegetable life—the basis and support of animal life.

The humus of the soil—remains of former races of plants—was for a long time regarded as the special means for feeding a new race of plants, and in the long ago of agricultural science King Humus ruled the vegetable world. It was supposed that material that had once gone the rounds of plant life could more readily contribute to the formation of a new generation of plants, securing, as it were, a re-incarnation of vegetable life.

But King Humus has lost his crown, and is no longer regarded as the pre-digested food to sustain a new race of plants. It is only indirectly that humus contributes to vegetable growth. His office is humbler—to elaborate out of soil the crude materials for another cycle of inanimate life.

The physical offices of humus in the soil are important, making the soil warmer by one and a half to two and a half degrees for the whole season from May to November, making it more retentive of moisture and holding ammonia from dissipation in the air or washing away in drainage water. Chemically humus is of great importance in the soil, for by its oxidation it is a constant source of carbonic acid. Dissolved in the soil water it becomes the true carbonic acid, $H_2\ C\ O_3$, instead of the less active carbonic oxide. Carbonic acid is among the weakest of acids. It has the touch of velvet, yet it will break barriers of rock. The vast limestone caverns of Virginia, Kentucky and Tennessee have been excavated—literally washed out—by water charged by carbonic acid, so that rivers now flow through these subterranean channels to the sea. Mammoth Cave was dug by carbonic acid. The soil water in our state holds carbonate of lime in solution by means of this acid.

Not only will this acid dissolve lime, but the ever-acting sapping and mining of this acid breaks up the granite rocks by decomposing the feldspar and mica they contain, and is one of the active agencies by which potash is set free from feldspar and mica. There is a saying

that "the constant dropping of water will wear away a stone." If we say "will dissolve a stone," thus seeming to wear it away, we shall get nearer scientific accuracy. This constant action of carbonic acid, "at noon of day and noon of night," is one of the agencies which has greatly modified the condition of the surface of our globe. The importance of a supply of humus in the soil as a constant source of this persistent acid has possibly been overlooked.

The humus itself has strong solvent powers, especially for the insoluble phosphates. The influence of oxygen in converting the metallic sulphides to sulphates and ferrous oxide to ferric compounds, thus breaking up the molecular structure of some of the hardest rocks, is too well recognized to need elucidation before this audience.

The uses of the minute organisms in the soil in elaborating plant food will probably be discussed by Prof. Marshall. The process of nitrification is still a matter of great importance in agriculture, even if the nitre plantations have become matters of history in consequence of the discovery of nitrate of soda in Chili. Nature is not crowded out of her normal field of work by discovery of temporary supplies in some province of her wide domain. She still works her continental nitre beds under favorable conditions, even if man forgets it in the discovery of a pocket of Chili nitre. Her mighty plan still moves on, forgetful of the forgetfulness of man. The wise farmer will seek to avail himself of her benefits, even if not quotable on boards of trade.

THE ACTIVE AND THE MECHANICAL ELEMENTS OF THE SOIL.

The relatively small per cent of active elements in the soil and the very large amount of mechanical elements attracted your notice. When we find that some of these materials do not enter into the structure of agricultural crops, or only in very small proportion, the question arises, Are they of any benefit? Take clay for example, a silicate of alumina, the aluminous material forming no part of any cultivated plant. The oxide of iron, while a necessary constituent of all chlorophyllous or leaf plants, is found in our soils in great abundance above all requirements of plants. Yet these materials, reinforced by the lime and magnesia in the soil, have a wonderful power of fixing in relatively insoluble form the materials for plant food that are readily soluble in pure water.

If we filter a solution of nitrate of potash through garden soil, the water that filters through will contain nitrate of lime, leaving the potash in the soil. If chloride of ammonium is treated in the same way, the ammonia is left in the soil and chloride of calcium is found in the filtrate. Thus the oxide of iron found in the soil and the clay are found to contain ammonia. A permeable soil is not necessarily a leachy soil. The cheap and abundant compounds of lime and magnesia are washed away in the drainage water, while the precious potash, phosphates and ammonia are retained in the soil. The great loss is nitrate, and the quantity is enormous. The Rhine daily discharges nitrates equivalent to 270 tons of nitrate of potash; the Nile, 1,100 tons, and the Mississippi 2,000 tons. How stop this enormous waste? The green withes did not suffice to bind the limbs of Sampson, but green growing crops will arrest the fugitive nitrates and hold them for use of man and beast by the halter of vegetable growth.

There are three elements in the soil upon which the chemist looks with special attention—potash, phosphorus and nitrogen. This combination constitutes the banking basis to sustain the green banks with which nature clothes our fruitful fields—the currency of vegetable and animal life, without which world-wide bankruptcy—famine—would blot out all forms of life.

DISCUSSION.

Q. Does the fertility get away through the tile when the land is drained?

Dr. Kedzie: But very little. As the water containing the plant food percolates through the upper two or three feet of the soil it loses the soluble salts, which become insoluble and remain in the ground. Naturally, if there be an excess of soluble food, especially nitrates, there is quite certain to be some considerable loss. However, the old idea that tile would leach the soil is now entirely exploded.

Q. Do you think the tile drains will help in maintaining or increasing fertility?

Mr. Kedzie: In some ways, yes. They remove the water which excludes the air necessary to make plant food already existing in the soil available. This insoluble plant food is made soluble by bacteria very largely. These bacteria cannot live where there is an excess of water. The drains by removing this excess of water therefore very directly aid the increase of immediately available plant food.

Q. Will humus not be lost where tile drains are put in?

Dr. Kedzie: While humus is not itself directly available as plant food it serves an indispensable purpose in retaining in the soil valuable elements of fertility in such shape as to become available to plants when they need them most. For instance, the water-holding capacity of the soil depends not alone upon the fineness of the soil particles, but upon the amount of humus which the soil contains. Humus is vegetable and animal matter slowly decaying. In very coarse soils this material decays too rapidly to form humus. In undrained soils it may decay too slowly or its decomposition may result in products absolutely harmful to plant growth. In the latter case drainage will actually aid the formation of humus.

Q. Do oxide of iron, humus and clay hold nitrogen?

Dr. Kedzie: No. Nitrogen may be washed away from them. The best good to the greatest number always comes in the proper balance of opposing forces. Were not a large proportion of the nitrogen washed away from our soils health would suffer. Where too much is washed away the fertility of the soil suffers.

THE SOIL AS THE BACTERIOLOGIST SEES IT.

PROF. C. E. MARSHALL, AGRICULTURAL COLLEGE.

The bacteriologist always has in view two distinct purposes when he begins a complete analysis of the soil. One is the relation of the soil to hygiene, in which he considers the dissemination of disease-producing bacteria, such as the germs of typhoid fever, lockjaw, quarter evil, anthrax, hog cholera, etc. The other is the relation of the soil to the changes wrought by bacteria among its constituents. The latter is evidently intended for our theme today.

Before attempting to study bacteria in their actions as carried on in the soil, let us make a cursory review of what they are capable of doing in general. A keener appreciation of what they can accomplish in the soil will be gained.

In ordinary fermentations we find micro-organisms at work changing starch to sugar, sugar to alcohol and carbonic gas, and alcohol to acetic acid, the acid of vinegar. Farther, you are all acquainted with the usual process of changing sweet milk into sour milk, or to be more exact, of changing sugar of milk to lactic acid. These changes are brought about by the direct action of micro-organisms. Moreover, what is known as putrefaction is attributed to micro-organisms also. A piece of meat is placed on the surface of the ground; in a few days it will have completely disappeared. You note in your wood lot the accumulation of heaps of dead leaves in the fall time, and before another season has passed these leaves have lost their organic structure and nothing but a black, loose dirt remains, mixed with a few remnants of leaves, to indicate the origin of the dirt. You place a straw stack in your barnyard, and each year, although you make no use of it, notices a marked decrease in its size, and eventually the straw, with its well marked outlines, lies a heap of black soil. In the manure heap the same thing is noticeable. Allowed to stand, in a few years there will be none. Whether it is the transformation of starch through sugar into alcohol, or milk sugar into lactic acid, or the destruction of a piece of meat on the surface of the ground, or the disappearance of the leaves in the wood lot, or the reduction of the straw stack or heap of manure, the principle involved in all of these actions is the same, and all of them are brought about through the instrumentality of micro-organisms.

The starch is more complex in its structure than alcohol and carbonic acid gas, and meat and leaves are far more complex than the resulting dirt which they produce. Remove the micro-organisms, the starch would remain as starch and the meat and leaves as meat and leaves. The action of micro-organisms seems to be that of reducing these complex materials to simples. The plant feeds upon the simple constituents of the soil and in turn feeds the animal which produces the meat; that is, the simple substances of the soil have been transformed into the complex substances composing the meat through the instrumentality of the plant. As the material leaves the soil it gradually becomes more complex till it has reached its most complex form, we will say, and then, after life has fled, it again returns to the simple elements of the soil through the agency of micro-organisms.

Picture to yourself an atom of nitrogen associated with less than a dozen atoms in the soil to form some soil compound, and then regard it in the animal body, associated perhaps with hundreds to form the substance of a muscle. Farther, imagine that atom of nitrogen in its complex association reduced to the simple combinations of the soil, or even free nitrogen of the air, then you shall be able to see that which it has taken the plant and animal to accomplish, has been undone by these simple micro-organisms.

The above action of micro-organisms we will call destructive or analytical.

On the other hand a constructive or synthetic process is possible.

If, for instance, the germ of consumption be placed in a purely mineral solution composed of simple compounds, this germ will utilize this solution in its growth and development in the manufacture of products of a poisonous and complex nature. That is just like the plant and animal. It is able to take into its body certain simple bodies and from them create highly complex bodies.

These represent some of the functions of bacteria worthy of keeping in mind; especially remember that bacteria are capable both of destructive processes and constructive processes, of analytic and synthetic measures.

The foregoing will introduce us to the study of soil, which represent these two processes from the bacteriological standpoint.

The bacteria of the soil are not found most numerous at the surface, but a little below. Those found near the surface are exposed to the alternative action of the sun, moisture and dryness, cold and heat; consequently many succumb. But a few inches below the surface the conditions are more equalized and the bacteria are better favored. We will say in this stratum the bacteria are most numerous, but begin to diminish in number as we proceed upward or downward. At the depth of six or seven feet very few bacteria exist.

The development of bacteria in the soil is dependent upon the available food for their growth, the moisture present, the temperature, which must be suitable, and a proper reaction; that is, too much acid must not exist to prevent growth. Another element enters in our progressive manipulation of the soil. Materials cannot be profitably utilized to check the growth of these micro-organisms without a knowledge of their action. This line of investigation has been undertaken to find a means of preventing the action of bacteria which tend to waste manurial value.

A certain amount of organic matter seems essential for the growth of bacteria. In soil possessing humus in suitable quantities, the decomposition or fermentation is carried on with the proper degree of intensity, for if the soil like fine sand be used where there is only a slight trace of humus, or a soil that contains too much humus, in the one case there is not sufficient food for the growth of bacteria and in the other there is too much, resulting in the production of fermentation products detrimental to the growth of many plants. It will be guessed that I am speaking of bacteria in general. The conditions under which nitrifying and denitrifying bacteria develop will be considered a little later.

Moisture is as essential for the development of bacteria as in the case of plants. A plant cannot sustain life without moisture. Therefore, in carrying on their functions, even if the nutrition of a plant is dependent upon their action, bacteria are useless without sufficient moisture. Dessication kills some, but most live through ordinary dessication and grow when the needed moisture is supplied. Prolonged drouth is more likely to produce undesirable results than when of short duration. While it is true that bacteria have a wide range of temperature, yet there are few bacteria which will grow satisfactorily below 60 degrees F., and as the temperature approaches 90 degrees F. the activity becomes much more manifest. This is easily discernible, for when the temperature rises the gases coming from a manure heap are plainly evident; let the temperature go down and the fermentation becomes slower. If the cow stable is considered, the fermentation of urine in hot weather will begin within one hour, while in cold weather there is little to be seen for several hours. From this we may conclude that temperature is one of the most important factors in the development of soil bacteria.

The reaction of the soil has no little significance at times. It is true that in the change of alkalinity and acidity, the life content of the soil undergoes alteration. At one moment one set of micro-organisms pre-

dominates; at another, with the changing reaction, a new set of life operates, owing to the exceeding susceptibility of bacteria to a change of reaction in environing medium. This is an agent which should receive attention in securing proper or improper conditions for the development of certain types of micro-organisms.

Two classes of soil bacteria stand out prominently in the microbial consideration of the soil—not that they are alone in executing important physiological functions in connection with the soil, but because they have opened up a new field of practical research and have answered some very important economic questions in the short time they have been under the eye of investigators. These two classes are the Nitrifying and Denitrifying Bacteria. Under the former class may also be considered those which utilize and fix free nitrogen.

It is, I believe, an accepted fact that nitrogen in the form of organic substances and as ammonia compounds is not the best combination for plant assimilation. For long years the process of changing ammonia compounds into nitrates, the most suitable form of nitrogen for plant assimilation was unknown until in 1877 Schlossing and Muntz ventured the statement that nitrification was the result of vital acidity, for the operation was almost stagnant at 41 degrees F., became apparent at 54 degrees F., and was most active at 97 degrees F. and gradually grows weaker as the temperature rises, and at 131 degrees F. the action ceases entirely. Moisture increases action if it does not prevent perfect aeration. A slightly alkaline reaction is also favorable to this class of bacteria. Sometimes the process stops with imperfect nitrification if the temperature is low and the supply of oxygen is short.

It is a recognized fact that an abundance of organic matter does not favor the growth of this nitrifying micro-organism. Winogradsky has given us two distinct classes of these micro-organisms, those which convert ammonia into nitrous acid or nitrites, partial oxidation, and those which do not act upon ammonia but attack the nitrous acid or nitrites formed by the former class and convert them into nitric acid and nitrates.

$$(NH_4)_2O + 3O_2 = N_2O_3 + 4H_2O.$$
$$N_2O_3 + O_2 = N_2O_5.$$

The above bacteria are spoken of in general as the nitroso and nitro bacteria. The nitroso bacteria are easily affected by dessication.

In the formation of saltpetre, the action of these micro-organisms plainly indicates their role in nature. The wall saltpetre which appears frequently on the walls of stables and closets (especially in tropical climates), results from the action of these germs upon the ammonia salt formed from urea. Calcium and alkali are in the wall and oxygen is present in abundance. The conditions for growth are favorable and saltpetre is formed. The masonry suffers accordingly from the corroding action of the acids formed.

Many of the large deposits of saltpetre, especially the soda saltpetre of South America, have been accomplished through the gradual nitrification of the organic matter accumulated there in large quantities through the instrumentality of birds.

This very natural means may be simulated by selecting a proper impervious clay bed and mixing with the organic matter chalky earth. Brush is placed in the heap to allow free circulation of air. The calcium,

magnesium and sodium nitrates are then treated with potash salt to convert them into potassium saltpetre.

In the manure heap and in the soil there is a process diametrically opposed to the preceding. Instead of nitrogen being rendered available to plant growth it becomes lost for immediate purposes.

The liberation of nitrogen and the denitrification of organic matter appeals to the farmer as an important economic problem. Attempts have been made to reduce this peculiar action to the minimum by various means.

In the decomposition of proteid material there is always considerable loss of nitrogen through the evolution of ammonia gas. Many bacteria have this power of acting upon nitrogenous material and producing ammonia. From the ordinary manure heap it is no difficult matter to separate several varieties belonging to this type. The ammonia escapes into the air and is consequently lost for direct fertilizing purposes. The manure has consequently lost so much in value.

Several species of bacteria have been found which are capable of producing free nitrogen. This, however, results from certain bacteria upon the nitrates already formed and do not act so much upon the proteid substances. With sufficient food some of these germs seem to possess no limit of action, and again there are some which possess this property to a very marked degree incapable of changing nitrates to free nitrogen unless associated with some other bacterium. The potassium or sodium present in the form of a nitrate is converted into a hydroxide and eventually change the medium in which the germs are growing into a condition inhibitive of life. The process may go on in many instances either in the presence of or absence of air. It becomes possible therefore for denitrification to take place either on the surface or deep in the soil.

These bacteria are present in the excreta of animals and especially the dung of horses. So great is the loss that it is claimed from actual experiment that only twenty-five per cent of ammonia is recovered in the plants.

In the transformations produced by this class of bacteria, there sometimes occurs a combination of nitrogen which in reaction with ammonia yields free nitrogen. This method differs somewhat from that of simple reduction of the nitrates.

What waste takes place by the growth and function of these bacteria it is not easy to determine, but it must be vast, inasmuch as it is likely to occur in all manure and all fertile soils possessing nitrates.

After discussing the value of the nitrifying bacteria and the loss accruing from denitrifying bacteria, it may be interesting and helpful to consider briefly that class of bacteria which abstract free nitrogen from the air for the utilization of plants.

It has been well known for a great many years that if seeds of leguminous plants were placed in a soil with all the necessary ingredients except nitrogen they would start their growth, and as soon as the food provided by the seeds was gone they would undergo a sort of withering process known as nitrogen-hunger for a time and then begin to resuscitate themselves. Most plants not belonging to the leguminosae withered away and finally died. Peculiar enough also was the fact that these leguminous plants and others following in the same category con-

tained much nitrogen which could not satisfactorily be accounted for. With the discovery of the root tubercles, or nodules, a fresh stimulus was given to the investigation, but no tangible knowledge could be obtained in regard to the assimilation of nitrogen until it was found that these tubercles or nodules contained a mass of bacteria which were able to utilize the free nitrogen of the air and convert it into a form suitable for plant assimilation.

If grown in sterilized soil these nodules do not form. This indicates that the bacteria are in the soil. Varieties exist, for it has been quite conclusively shown that the variety found on one plant cannot be inoculated into another with success.

Germs which are capable of abstracting nitrogen from the air are found in crevices of bare rocks. Here they probably convert the nitrogen into the form of nitric acid, which acts upon the rocks and dissolves them.

In conclusion, aside from the hygienic consideration, we may assign to the micro-organisms of the soil the following functions:

1. The fermentation of organic matter, resulting in ammonia compounds along with others.
2. The action of nitrifying bacteria upon the fermentation products.
3. The liberation of free ammonia, soil fermentations.
4. The liberation of free nitrogen by means of denitrifying bacteria in their action upon nitrates.
5. The abstraction of free nitrogen from the air by bacteria and its conversion into a form assimilable by plants.
6. The abstraction of free nitrogen from the air by bacteria and its conversion into a form in which it may act upon rocks and reduce them to arable soil.

DISCUSSION.

Q. Has there been found anything to catch nitrogen? Does land plaster retain nitrogen in fermenting manure?

Dr. Marshall: There is a wide difference between lime and plaster in their relation to ammonia. Plaster, in the presence of abundant moisture, seems to have the dual effect of somewhat retarding fermentation and absorbing ammonia. Lime, on the other hand, by chemical action, drives off ammonia, acting as a caustic. Its action in this respect is brief, however, as it soon changes to carbonate.

Q. Why is plaster not as good as thirty or forty years ago?

Dr. Kedzie: In the natural order of things, but thirty or forty pounds of plaster can be utilized per acre per year. Plaster was applied at the rate of 200 pounds to the acre, and now the soil has all that it needs. This excess of plaster will not always remain, but it will gradually be washed away.

Q. Is thirty pounds of plaster to the acre then enough?

Dr. Kedzie: With thirty inches of rainfall our ordinary soils can use but thirty pounds of plaster per acre per year. Some crops receive benefit from the plaster; others get none. Legumes usually are benefited by an application of plaster.

MAINTAINING FERTILITY WITH GREEN MANURES.

PROF. J. D. TOWAR, AGRICULTURAL COLLEGE.

A fertile soil is one rich in the elements of plant food and full of organic matter. To restore an exhausted soil to a condition of fertility, or maintain and improve the crop-producing quality of a fertile soil, we should first see that its supply of humus is kept at the normal. We are coming more and more to value the virgin humus, now it is gone, and our agricultural papers are crowded with articles on obtaining and maintaining this valuable material. It keeps the soil open for the admission of air and the free distribution of roots, it helps to hold moisture and it favors bacterial growth. By the slow decay of humus, carbonic acid is formed and brought in contact with the undissolved materials which contain the needed food of growing crops. Humus further aids in lightening heavy clays and in binding the shifting sands. In extreme hot weather it serves to regulate the temperature of the soil.

Soils may be rich and productive in the absence of humus, but ideal conditions which hold moisture, conserve and develop fertility and favor growth are not insured in the absence of a normal supply of organic matter. Time was when the summer fallow was a seeming necessity, and in truth it has produced the wheat crops that have lifted many a mortgage in our State. Yet, though it lifted the money mortgage, it planted on those fallowed acres a mortgage on the fertility, secured by the unwise deeds of our fathers, that only the best intelligence and shrewdest managers of the present generation can eradicate. The summer fallow, and the winter fallow as well, invariably increase the yield of the succeeding crop. But good agriculture rebels against such heroic means of treating the soil, and I verily believe that the exhausted condition of many of our older Michigan farms are largely due to these severe practices. How then is the supply of humus to be maintained, and what are the sources upon which we may draw? First, The roots and stubbles of plants. Second, Coarse manure produced on the farm. Third, Green manuring. Observe that green manuring is placed last, and it is there that it belongs, because it is only a process to supplement the other natural sources of organic matter. It is not a practice that takes sides by itself and alone, though we might suggest a system of rotation which by means of green manuring and grain farming the fertility of the farm might be maintained and yet produce profitable returns. But this sort of practice would not obtain favor where so intense an agriculture is practiced as we have in this State. It is in connection with mixed farming, live stock, and even fruit and vegetable farming, that green manuring comes in for its greatest share of credit and recognition.

We may say that green manuring as a definite practice is not a common one, though in reality we are continually turning under green growth, while our best rotations involve green manuring methods in the highest degree.

For convenience let us assume that crops are grown for commercial and for soil improvement purposes, and to the credit of the practice of

green manuring give all the results of growth which lend any measure of green material to that which is plowed under. Furthermore, to make green manuring possible we must assume that the soils are to remain idle for a portion of the time, that is, that they will not be continually employed in the growing of commercial crops.

The very nature of the soil as to its liability to waste during idleness, as a man spends his money while his time is not employed, demand that the soil be kept occupied all the time. The solvent action of the acids secreted from the roots of plants indicate to us that if we would make the most of that large store of mineral plant food possessed by our ordinary soils we must encourage the continual growth of food storing plants during the periods separating the growth of commercial crops. A glance at the history of soil formation suggests at once to us the wisdom of this practice. It is reasonable to suppose that the agencies which wrought to transform the solid rocks into our fertile soils are still as actively at work, and are encouraged in this activity by the presence of developing organisms. Some of this plant food is digested or dissolved by bacterial growth within the soil, and if not assimilated by a growing crop will be converted into a gas, and escape into the air or be leached away by drainage water. The presence of a growing crop not only utilizes the products of bacterial development but it is found that the growing plants secrete at the extremities of their roots an acid which serves to digest the food materials in the soil. These facts, together with the silent influence of shade in holding moisture, protecting the humus from the burning action of the sun, and the encouragement it offers in the friendly microbe in the improving of the soil under its protection warrants the intelligent farmer in keeping his soil continually in the shade of a growing crop.

Green manuring, however, is a slow process, and it has no claims to the panacea for all the existing ills that obtain in our wornout soils. And while theoretical agriculture may support it as a scheme for reclaiming an exhausted soil, it is a process too slow, uncertain and expensive.

What does green manuring do? It utilizes available plant food produced in the soil which would otherwise be wasted. It sends down its roots into the deep sub-soil and brings to the surface for succeeding crops large quantities of plant food in the form of mineral matter from the lower strata and soluble materials which have been carried below in the drainage water.

LEGUMINOUS PLANTS.

In the case of legumes, it adds large stores of organic nitrogen to the surface soil, thereby increasing the available plant food, though with regard to the mineral elements no green manuring plants have the power of adding them to the soil. Mineral elements, however, are dissolved and made available to succeeding crops by the process of green manuring.

Where then shall green manuring be practiced and what are some of the agricultural plants valuable for this purpose? In general, the intelligent farmer will practice green manuring only as a catch crop, that is, between the commercial crops grown upon the farm. With the grain farmer, or on the farm where only a small quantity of live stock is kept, a crop grown solely for the purpose of improving the soil may well con-

stitute a member of the general rotation.

Where and what? In the early spring peas and oats, winter vetch.

The summer crops for green manuring are cow peas, soy beans, field peas and buckwheat.

Late summer crops—Winter vetch, oats, peas, crimson clover.

Fall crops—Rye, wheat, peas.

For instance, the corn field, instead of lying bare all winter, should be sown at the last cultivation to rye, winter vetch or crimson clover. If the field is to be sown to oats the following spring a mixture of oats and peas, or peas alone, may serve as a catch crop and act as a valuable winter mulch, while in the following spring it may be harrowed in with a revolving harrow and the ground prepared for oats without plowing, as is commonly practiced.

Wheat and oats stubbles may be harrowed immediately after the removal of the grain crop and sown to crimson or even red clover, if the conditions of moisture are such as to promise a catch. If the clovers do not succeed and the ground must lie barren until the following spring, another harrowing will suffice to prepare the ground for a crop of rye, or even wheat, to be used as green manure.

The family garden reveals exposed places after each succeeding crop is harvested during the summer. These will be enriched, improved and even beautified if sown to crimson clover. The orchard which has been in cultivation up to the first or middle of July is much improved by growing from then on, a crop of crimson clover as green manuring.

The soy bean and the cow pea have been much praised as green manuring crops and in their place they are worthy of much credit. These plants are, however, strictly summer crops, and our cold climates do not favor their growth as does their native climate and southern soil. If opportunity is afforded for green manuring during the warm summer months no better plant can be suggested than the cow peas, unless it may be our native field peas, which, all things considered, may be fully as safe to adopt as the cow pea until the latter has become more thoroughly tested. It must be borne in mind that the cow pea and the soy bean are both very tender plants and readily succumb to the first approach of freezing temperatures.

Instances have been recorded where injurious effects have followed the practice of green manuring. Where a large crop of green, succulent growth is turned under during warm weather there is danger of forming within the soil an excess of organic acids, which will injure the growth of young plants. To remedy this difficulty an application of a small quantity of lime, say one ton to the acre, well harrowed into the soil, will generally prove effectual. It is probably a better plan, though, to plow some four or five weeks before the time for sowing the crop, in which case there is generally very little danger from the acids formed.

Green manuring in connection with general farming should supplement the manures naturally produced in the stables, or, perhaps better, the manure produced in the stables should supplement the green manure. For it is readily seen that were we to depend on the growth of green crops to improve our soil the richer portions of the field would be improved in proportion to the natural fertility, thereby producing an imperfect result. Therefore the stable manure should be placed on the exposed and more exhausted places, thus working in harmony with the green manure to produce a uniform fertility.

DISCUSSION.

Q. Is rape a good plant for green manure?

Prof. Towar: If for any reason you can use no legumes you would do well to use buckwheat or rape. I would recommend, however, either the clovers or some of the newer legumes, particularly the vetches.

Q. What is the difference between summer and winter vetch?

Prof. Towar: The winter vetch may be treated as a summer or winter crop. To get the best results, sow in August, using approximately a bushel of seed to the acre.

Q. Is crimson clover a good crop for green manure?

Prof. Towar: Yes, only for fall growth, as it winter kills badly in this latitude.

Q. Where a field is badly set with sorrel, will the vetch succeed?

Prof. Towar: I think that the vetch would crowd out the sorrel.

Q. How do you sow?

Prof. Towar: Either in drills and cultivate, or broadcast. If the land is free from weeds I should surely recommend the latter.

Q. Is there any danger of its becoming a weed?

Prof. Towar: Not under ordinary circumstances, although there are cases reported in the northern part of the State where it comes in voluntarily.

Q. To the owner of the orchard the great question is one of moisture, would not growing these green manure crops lessen the crops of fruit by exhausting the moisture?

Prof. Towar: You will naturally cultivate your ground up to the last of July or possibly into August, and then sow crimson clover to prevent loss of fertility during the fall rains, and possibly to aid in ripening the trees, especially the peach, where late growth is liable to be killed the next winter.

Q. Is vetch good for hay?

Prof. Towar: Animals have to learn to like it. It is not reported to be a good pasture plant, and our experiments with it as hay have not been sufficient to assure us that it makes a hay of which stock are particularly fond.

Q. When should you plow under cow peas, in the fall or spring?

Prof. Towar: This is a hard question. In some respects it might be better to leave on the surface of the ground as a mulch, and plow under in the spring. I believe that this would be the better practice.

Q. We want light on the clover question. What do our soils lack that clover will no longer catch?

Prof. Towar: Our experiments at the College lead us to believe that one reason why clover does not catch as well as formerly is because the humus is becoming exhausted. Clover was sown under three different conditions at the College: first, on land that had been cultivated forty years, and the clover sown with wheat: this clover was a failure. Second, on land also under cultivation for forty years, but the clover sown without a nurse crop; here we had a good stand and a good crop of clover. Third, a large field, forty acres, on new ground, was sown in the spring on wheat; here the crop was good.

Q. Can we not sow clover in the fall?

Prof. Towar: That depends on the winter. If you are sure of a continuous body of snow, I think that clover will do well sown in the fall.

E. L. Lockwood, Petersburg, Michigan, recommended beardless barley for a nurse crop because it shades the ground but little.

SOIL PHYSICS.

PROF. J. A. JEFFERY, AGRICULTURAL COLLEGE.

The chemist and the bacteriologist have each spoken to you of the soil from his point of view.

I have been asked to speak to you on the same subject and to give you a few thoughts from the standpoint of the soil physicist.

Soil Physics has for its object, among other things, the study and mastery of those conditions which shall promote chemical, physiological, bacteriological changes. Its realm is largely within the soil. Here lie humus and minerals waiting the magic touch which shall change them into forms such as the plant may use. The soil may be ever so abundantly supplied with materials, but unless these transformations take place they cannot be used and the husbandman's labors are in vain—they bring him no profits.

All appreciate, to some extent at least, the importance of water in agriculture. We have observed that in its absence plants droop and die, and that in its presence, in normal quantities, they revive and take up again and accomplish the work for which they were created. We hardly realize why this is so, but our observations confirm the statement. The reason lies in the fact that only when moisture conditions are proper can the chemical, physiological and other changes take place.

There must be present also air, and a proper temperature must be maintained in order that these changes may be accomplished. If these conditions fail in any particular this work is handicapped.

The moisture, air and temperature conditions depend primarily upon the physical condition of the soil, while the air and temperature conditions depend very much upon the moisture conditions.

The physical condition of the soil will depend largely upon the size of the ultimate grains of which it is composed and upon the manner in which these grains are combined into compound grains. Upon the size of the ultimate soil grain will depend the amount of total surface which a soil will present to the action of roots and to the action of solvents; upon the manner in which these ultimate grains are compounded, or aggregated, will depend the openness of the soil, its air content, its water holding capacity, and the ease with which roots may reach out through it for food and moisture. It is the study of these features of the soils, and methods for handling them, that presents to the soil physicists the most important field of labor.

A few facts concerning soils may be of interest:

Some of our clay soils are so fine that to count the grains in the 1-28 part of an ounce, counting at the rate of one grain per second, ten hours per day, 313 days per year, would require 525 years to accomplish the undertaking.

If the grains of a cubic inch of this soil were laid in a line, grain touching grain, that line would reach over 500 miles.

The total surface of a cubic foot of this soil would measure about seven acres.

If these soils were broken down so that no aggregates remained, and supposing all of these grains were of the same size, and these were packed in the closest possible manner, there would be still about 26 per cent of unoccupied space between the grains, but if the grains were not of the same size they might be packed so that not over 10 per cent or even 6 per cent of space remained between the grains. But as a matter of fact it is difficult, with the soil above described, to reduce the pore space to 50 per cent. In the field the pore space would be even greater.

The chief difference, according to Prof. Whitney, between the worn out tobacco lands of Virginia and the best wheat lands of Maryland, is a difference of physical structure. A chemical analysis shows the so-called "worn out" lands to be richer in plant food than the productive wheat lands. Apparently the aggregate grains of the Virginia soils have been broken down; in other words, their tilth has been destroyed. It is a case of destruction rather than of exhaustion. The capacity of these soils to gather and hold moisture and to have an abundance of air has been destroyed. This is possibly an extreme view to take of the matter, but it offers material for thought.

Air we have with us always, and in abundance. Not so with moisture. And yet our moisture resources are great, if we could but control them.

In 1898 the rainfall at the College from April 1 to July 31 was 13.38 inches—enough to produce a crop of 44 bushels of wheat per acre, 60 bushels of barley per acre, 80 bushels of oats per acre, 80 bushels of corn per acre, 600 bushels of potatoes per acre.

The rainfall between April 1 and September 30 was 15.50 inches—enough to produce 3½ tons of clover hay per acre, 7 tons of fodder and corn per acre, or 11 tons of silage.

The moisture in the upper five feet of soil on the first day of April available for plant use would give very nearly the above yield, if it could be made to do its fullest duty.

Combining the moisture present in the soil with that which falls during the growing months, what enormous yields would be possible, so far as the moisture side of the question is concerned. And yet the amount of moisture used in the actual growth of crops scarcely exceeds one-half of either amount. Why? Partly because we have not yet learned to use the means at our command to conserve and to utilize this moisture.

Every farmer may become a soil physicist. He may increase the capacity of his soil both to gather and to hold moisture; he may increase its air supply and regulate its temperature.

The Campbell method of soil culture has for a few years past created quite an interest in certain sections of the west. Its object, primarily, is to so handle the soils of the semi-arid regions as to fully utilize the rainfall in growing crops.

The system may be briefly described as follows:

1. Before plowing, the ground should be gone over with a disc harrow.

2. Plow deeply—six to eight inches.

3. Follow the plow within a few hours with a sub-surface packer. This implement consists of a series of narrow-edged wheels set about five inches apart upon a common axle. The packer is heavily weighted, so that the wheels sink well into the soil, crushing the heavier clods

and bringing the newly turned soil in close contact with the bottom of the furrow under each wheel. This sets up capillary relation with the soil below and insures the upward movement of moisture from below, and this insures moisture for the decay of organic matter and for the germinating seed.

4. Follow the packer with a light harrow and harrow at short intervals, excepting in winter, till seeding time.

5. Sow grain in drill, 18 to 24 inches apart, and when up cultivate from time to time till grain is headed. Plant corn and potatoes in the usual way and cultivate.

The cultivator used in this work is of the weeder type.

The amount of grain used for seed is from one-fifth to one-quarter the amount usually used.

Mr. Campbell's theory is that a few plants with an abundance of moisture and air will give a greater yield than a larger number of plants with scant supply of moisture and air.

Some very remarkable results have been secured by this method of handling soils and they indicate that the right principles underlie the system.

TILLAGE IN THEORY AND PRACTICE.

HON. ROLAND MORRILL, BENTON HARBOR.

An abstract of the address follows:

Because I advocate thorough work in tillage, making my practice correspond to the late theories of the scientists, I am called a crank. All thinking men, successful in business, are apt to be cranks and perhaps ought to be. A crank may be defined as a man who knows one thing well and is enthusiastic about the one thing which he knows well. It is seldom that we find a man that knows everything or that does not have to learn some things that later he has to unlearn. The man who has unlearned the things which he had learned for true, and later finds out to be untrue, is the safe man to act as guide. There is no royal way of avoiding making mistakes, the best way being to adopt the theories of the scientists tentatively and reject such as experience does not prove to be well founded.

The common condition against which farmers have to work in average seasons is the drouth. To prepare for this condition the ground must be properly worked in the spring and fitted for the crop. Dollars unnumbered are laid out on land and lost every spring because the ground is not properly prepared. The mechanical condition of the soil must be adapted for a given crop, and tillage must be directed along lines adapted to the given crop. Certain crops are adapted to certain soils, while some crops fit almost any soil. But all crops on all soils require intelligent treatment, intelligent tillage.

The first rule that ought to be laid down is that farmers should cease tilling more land than they can till well. People forget that fertility available for a given crop can be increased by tillage as well as by

the application of manures. Tools are the key that unlock the elements of plant food locked up in the soil. All that man can do is to assist nature. She has provided in most of our soils fertility abundant for the needs of our crops. We can by judicious tillage set the plant food free, as our crops demand it. We must work intelligently. We must eat our bread in the sweat of our face, as well as the sweat of our muscle. Our muscle must be guided by intelligence, and the tillage must be adapted to the given crop. For instance, no one would think of preparing the ground the same for wheat and for sugar beets. Corn likes a soil mellow to a good depth, while wheat wants a well packed sub-soil with a mellow surface. Cultivation is directed to two objects: First, to kill weeds, and, second, to conserve moisture. There is a right and a wrong way to cultivate for the latter purpose. Take the corn crop for instance; here we must plow early to save all the spring moisture, cultivation begins as soon as the plowing is done to conserve the moisture. By this I mean that as soon as the ground is plowed and the surface dried it is harrowed, and put in the proper tilth for receiving the seed. As soon as the corn is planted the field is harrowed to kill the young weeds as soon as they have germinated and to prepare the surface mulch to prevent the transpiration of moisture. If the ground be a clay loam, use a rather heavier harrow with slanting teeth, but if it be a sandy loam use a weeder. Later, when the corn shall be well up, cultivate deep at first and gradually lessening the depth until the later cultivation be not to exceed two and one-half inches deep, the cultivator going frequently over the field.

I can grow a crop of early potatoes and secure a good harvest with not a drop of rain between planting and digging. To do this I must understand the root system of the crop and cultivate accordingly, keeping the surface soil well stirred and a dust mulch to the depth of a couple of inches over the entire field.

DISCUSSION.

Mr. Greening of Monroe: In our nursery work with fruit and forest trees we find it advisable to cultivate deep where the trees are small, and shallower later. On heavy soil we cultivate deeper than on lighter ones.

E. L. Lockwood of Monroe: After all is said that can be said on other points it must be admitted that the cow is the bed rock of fertility. She has many enemies to fight, among which not the least is counterfeit butter. It is the duty of the government to protect the farmers against this evil. It is to be regretted that Mr. Lillie could not have been here to discuss that most important topic, the relation of live stock to soil fertility. No discussion could be more helpful to this Institute than one relating to cows.

Q. What kind of soil produced the melons to which you refer?

Roland Morrill: It was a rich black loam.

Q. How deep should the cultivation be for melons?

Mr. Morrill: A maximum of four inches, grading off to shallow. Be careful not to kill the roots. If no rain is expected compact the lower soil and form a surface mulch.

Q. Would you use a roller?

Mr. Morrill: Yes, at the right time, and in the right way.

Q. Where did you raise these melons?

Mr. Morrill: Near Benton Harbor.

EVENING SESSION.

UNIVERSITY HALL.

Dr. R. C. Kedzie, LL. D., of the Agricultural College, who attended the first Institute held in the State, presided. The music for the evening was furnished by the University Glee Club. The topic for the evening was "Higher Education."

AT THE UNIVERSITY.

BY DR. JAMES B. ANGELL.

An abstract of his address follows:

I am glad to welcome this representative collection of Michigan farmers to the halls of your State University. I trust that all of you desire to inspect the grounds, buildings and laboratories. I hope that all of you will have opportunity to visit all of them. Our doors are ever open to Michigan guests. All of you are most welcome. I often wish that we could move the University about the State to show it to the people by whose taxes it is supported, but this cannot be done. Therefore only a few who support the institution can visit it. I wish every citizen could come to Ann Arbor. Be assured that we desire to show you all exactly what we are doing, explain to you our objects, desires and methods, that you may fully realize that we are not working for ourselves, but for you. We understand fully that these State schools are yours. It is not our University as distinguished from yours. We who are now serving you as members of the faculty to help carry on the work are acting as your servants. We come and go. None remain here long, but the institution we hope is to stay forever.

Our connection is indeed transient. Of the more than 200 persons now constituting the teaching force of this University only four were here when I became its president. It is, however, the same University, growing younger and stronger every year.

We are glad again for every opportunity to welcome the business men of the State. Those great men who planted these schools were far-seeing, and everyone who studies must feel within him growing the reverence for the great men who framed the Michigan constitution in 1837. We can never pay them sufficient honor. When you return home take up that constitution and read the paragraph on education.

There is nothing nobler in the history of this whole country than the sublime thoughts of these great men in founding the school system of Michigan, crowned with the University. These men came from New York, Massachusetts and New England. They were poor; they had nothing but land, brains and high resolves. They could not allow their children to grow up in ignorance. That was to them unthinkable.

They could not send them to the eastern colleges; they were too poor. Acting under the inspiriaton of the constitution of 1787, Congress had made grants of certain lands, and these Michigan pioneers gladly accepted them. The funds thus obtained served as a foundation of Michigan schools for higher education, and the State has grown with two generations of men educated within her own borders.

While the University came into life in a small way, there are now over 3,300 students receiving higher instruction. There have been more than 30,000 students within her halls since the foundation, 15,000 of them being sons or daughters of farmers. Can anyone fail to do honor to those who laid the foundations of these schools?

Do you know that the total cost of this University from the day of its foundation to the present time has been about that of a modern battleship?

The primary object of the University was to give a higher general education. It has done much for the farmers, and in many ways. It has educated many of the faculty in your own Agricultural College. I have but to refer to Dr. Kedzie and Dr. Beal, men who have done much to make that great institution what it is.

Again, the researches in University laboratories bear directly on agriculture. I think of the work of Dr. Vaughan and his assistants. Again, many of our graduates are in other laboratories working for the advancement of agricultural science. In this list may be mentioned Erwin Smith. The University is justly proud of its graduates who are devoting their lives to these lines of work.

The first object in the University training is to make of the students men. The University must train for every service in life, and the foundation of that training must be the development of manhood. The history of the University will show that we have succeeded in this object. Our graduates are honoring the callings which have chosen them. When the Nation calls for eminent men, it goes to our alumni. In Congress there is a larger number of alumni of the University of Michigan than from the graduates of any other university in the country. Two out of the five commissioners to negotiate a treaty with Spain were chosen from the graduates of this University. Two out of five of the commissioners to govern Manila were chosen from the graduates of our University. Bright as has been our past, the future is even more brilliant and promising.

The faculty and students can do little or nothing without the respect and moral support of men and women like yourselves. The future of the University would be dark indeed without your clear understanding of its objects and wants and without your cordial support. We are therefore delighted to see you here tonight, and when you go home we want you to take a friendly message from us to your friends, to whom has been denied the privilege of attendance upon this Institute. Make them feel that this University is theirs, and its future success depends upon their cordial support.

HIGHER EDUCATION AT THE STATE NORMAL SCHOOLS.

PRINCIPAL E. A. LYMAN, MICHIGAN STATE NORMAL COLLEGE, YPSILANTI.

During the past twenty years Michigan educational institutions have experienced an unprecedented growth. When I entered the University in 1882 from a farm in Northern Indiana the attendance was about 1,300, while today it is not far from three times that number. Among the students you will find representatives from every part of the United States and from nearly every civilized nation on the globe. But the students alone do not make an institution great.

There are several reasons why the University occupies the eminent position that it does. Among these might be mentioned the excellent plan for the foundation of the University as outlined by State Superintendent Pierce in his first report to the legislature. Another reason, the University is supported by the State and has the people of Michigan behind it. Still another reason, but by no means the least, the greatness of the University is due to the eminent teachers who have always been found in its faculty, men who have devoted their lives to their work and have stamped their personality on the students who come in contact with them. I am here tonight to represent the State Normal Schools and not the University, but I could not let this opportunity pass without expressing my own gratitude and obligation to the University of Michigan for what it has done for me.

During this same period of years, 1882-1900, the attendance at the State Normal College at Ypsilanti has increased from 330 to nearly 1,100. The number of graduates in 1882 was 81, while this year we shall have over 360. In the history of the Normal School there has never been more than two per cent of the attendance from outside the State, and this year, out of nearly 1,100, we have but twenty-two from other states. But the increase in numbers does not tell the whole story. There has been a corresponding increase in the teaching force and facilities, and we have now about reached the limit of our capacity. Furthermore, manual training is becoming an important educational factor, and if we wish to keep pace with other normal schools we must have some facilities for doing this kind of work. It would therefore seem that we would be entirely justified in asking the State legislature at the next session for a science building to be devoted to laboratories and manual training.

When Superintendent Pierce submitted his report to the legislature recommending the foundation of the University, he mentioned normal schools, but made no recommendation. It was not until 1850 that the legislature passed an act consolidating two previous acts founding the Normal School, now the State Normal College. This institution was located at Ypsilanti. It is the sixth institution of the kind founded in the United States, and has for years ranked among the very best, if not as the best. The people of Michigan and the legislators have been kindly disposed toward the Normal School from the beginning and have been inclined to be liberal in appropriations. The importance of train-

ing teachers was early recognized, so that we find in the State Normal Schools of Michigan that the work is essentially professional. It might be compared to the work in the law department or the medical department of the University. None of you would employ a lawyer to take charge of an important case who had entered the University of Michigan law department and simply done work in the practice court without laying a solid foundation in the knowledge of law. Likewise you would hesitate to employ a physician who had taken a course in practical anatomy without having taken a complete course in the study of medicine. Likewise, professional training alone will not equip teachers for their important work. There must be sufficient academic work provided to serve as a basis for the professional training. Scholarship is the first essential of good teaching. The teacher must not only know the text-book the class is using, but he must know the subject. The training and culture of the teacher must be far beyond the limit which he is called upon to teach. The State Normal College at Ypsilanti therefore occupies the field of higher education in all important lines of work, since it is the function of this institution to equip teachers for all kinds of positions.

In this respect our State institution differs from most normal schools, which devote themselves almost entirely to professional work, omitting the academic work. Supt. Aaron Gove said, in the National Educational Association last summer at Los Angeles, that graduates of normal schools do their best teaching the first year, and after that begin to deteriorate, but I am sure Supt. Gove had in mind graduates of those normal schools which do simply professional work and lay no stress upon academic preparation. If this is the class of schools he had in mind, I am sure that he is right. They turn out nothing but machine made teachers, teachers who are crammed full of lesson plans and nothing else.

On the other hand, I know that it is the sentiment of a large number of superintendents in Michigan that in the State Normal College students do acquire scholarly habits, they do get enough academic training to serve as a basis for their work, and they do keep up their studies and work after they leave the institution. As a rule, they do not deteriorate, but they grow better. In addition to the work which has been mentioned, there is in connection with the State Normal College as well as with the other Normal Schools of the State, a training school, incorporating each of the eight grades and a kindergarten. Each grade is in charge of a special critic teacher and the whole school under the direction of a competent superintendent. In this school each student is required to do twelve weeks of teaching before he is graduated. He is required here to put into practice the theories that he has learned. He is tested so that we have some means of knowing whether he has teaching ability or not.

The State Normal School at Mt. Pleasant, founded some years ago for the purpose of training teachers for the rural schools and the lower grades, has continued in growth from the beginning until the attendance has reached nearly 450. The object of this school is essentially the same as that at Ypsilanti.

The third school, located at Marquette, has just been opened, and what its future will be is not yet known. It has started out fairly successful with an attendance of about 70.

I see by your program Thursday forenoon is set aside to give you an opportunity to visit the educational institutions at Ann Arbor and Ypsilanti. I wish to express here a hope that a large number of you, if not all of you, will visit the State Normal College and look over your property and see what we have and what we are doing. We will try to give you an opportunity to see the student body assembled at chapel, and I wish to assure you of a most cordial welcome both from faculty and students.

HIGHER EDUCATION AT THE AGRICULTURAL COLLEGE.

PRESIDENT J. L. SNYDER, AGRICULTURAL COLLEGE.

If passengers are kept in the hold, a wise captain and crew can run the ship. But if all the passengers, steerage and cabin, are on deck with a voice in the choice of a captain, and to whom he must report his plans for their approval, then, of course, the passengers must be wise, else they will all soon go to the bottom together. On the grand Ship of State upon which we are passengers, all are allowed on deck and have an equal voice in the selection of a captain, and in formulating the laws by which his actions are to be governed. It follows that those upon whom the responsibility of choosing a captain and the making of the laws depend, must be wise, or the great Ship of State will soon be floundering on unknown seas, and will, ere long, add another to the many wrecks of the past.

It is generally admitted that intelligence and morality are absolutely indispensable to the perpetuity of our government. This being true, the government, as a matter of self-preservation, has encouraged public education. It has given up millions of acres of its public domain to establish free schools, with the belief that free schools would make good citizens. If the object of public education is to make good citizens, it is pertinent to inquire as to what are the principal characteristics of a good citizen. He must be moral. Yes, he must feel a responsibility to his Creator. If he does not respect God's laws, he is not likely to obey man's laws. He must be intelligent, or must have at least a fair degree of knowledge. One cannot be a very good citizen of this country if he is ignorant of its natural resources. How can one sing, "I love thy rocks and rills, thy woods and templed hills," who knows nothing of the extent and beauty of our fair land? To love his country one must know what it has cost. He must be familiar with the struggle of our forefathers—Bunker Hill, Saratoga and Yorktown must be terms which will stir within him patriotic emotions. He must know what our country stands for among the nations of the world. Yes, morality and intelligence are necessary qualifications for good citizenship, but are they all that are required of the good citizen?

You can find many able bodied people with both these qualifications who depend upon public charity for the means of subsistence, who are either too indolent or do not have sufficient energy and skill to earn a

living. In addition to morality and intelligence the good citizen must be an independent being. He must be a producer. He must be able to give to his country as much as he takes from it. If he does not produce material things with his hands, he must, by skill or brain, produce an equivalent which he can exchange for these material things. He must be able to earn an honest living for himself and his family. Therefore, if it is the object of public education to make good citizens, it must give to these citizens not only morality and intelligence, but such other training as will make them capable of self-support. This does not mean that every boy in our public schools should be taught a trade, but it does mean that his education should keep him in touch with his environments, so that when his school days are over he will be able to take hold of the practical affairs of life in a practical way; that he will be fitted rather than unfitted for his daily tasks; that he will not be led to the belief that there is a sort of genteel way of making a living which does not require hard work. As far as possible his education should bring him into close sympathy with the calling in life that he will be compelled to follow after leaving school.

Very important changes have taken place in the theory of higher education in recent years. Public land was set apart for educational purposes by the ordinance of 1787 on the theory that "Religion, morality and intelligence are necessary to good government and the happiness of mankind." This act was in keeping with the spirit of the times. The mental and the material progress of the country were not supposed to bear any close relation with each other. Higher education was for the few who expected to follow one of the learned professions. It had nothing to offer to the man who worked with his hands for a living; it stalked the streets in broadcloth, but never looked into a sewer; it did much for men's souls, but very little for their bodies.

But, as our country developed, and as new discoveries in science were taking place in rapid succession, changes in higher education followed. Educational processes preceded rather than followed the theories upon which they were based. Necessity would force a new study into the curriculum on account of its practical value; it would soon take pedagogical form, and then its value as a purely educational factor would be explained and defended. In this manner the curriculum of our universities was broadened from year to year. "At the same time both elementary and higher education were blindly groping toward that higher conception of fitting man for living, moving, and having his being, in this his environment, by training his mind and body through the instrumentality of the very things composing this environment. Slowly the notion was forming that the mind grows by what it feeds upon: by the multitude of sensations which come flocking to it through the senses." That as far as mental development is concerned it is of much more concern how the student studies than what he studies. And so it has come to be accepted that the mind may grow on chemistry as well as philosophy; that it may expand under the influence of science as well as poetry.

There have been marvelous material, economic and scientific changes in this country since the passage of the ordinance of 1787. At that time the steam engine was new and of but little use. The first steamboat had not yet been built. Railroads and the wonderful develop-

ment in electricity were unknown. The onward march along all lines since that time is almost inconceivable. These changes influenced greatly the trend of higher education. "The impression gained ground rapidly that higher education should not be limited to those fields of operation in which medicine, law and theology played the predominant part, but that the best thought and the highest culture should be used in developing our industrial arts, and in making science the handmaid of toil; that it should arm and equip man for his struggle with the material universe. That our educational system should be so reconstructed that the trained mind, the knowledge and methods of the educated man, should be brought to bear upon the solution of the problems of war, commerce, agriculture, manufacture, public health and government."

It was also believed that education was not without economic value; that it should be made to contribute more largely to increase the wealth of this nation. For as the nation is prospering financially, it grows intellectually. The material and the intellectual welfare of a free people are very closely allied. The masses, under any form of government, cannot rise intellectually unless they can prosper financially. Long hours of toil and an empty stomach are not good conditions for intellectual growth. But with all our inventions and improvements in machinery, art, trade and travel, have come shorter hours for those who toil. This means more time for social enjoyment and intellectual improvement. Under the land grant act of 1787 higher education was practically limited to the few, and did not fully meet the needs of the young growing American nation. The advantages in this country should not be for the few; every man has the opportunity to rise; there is no class distinction; the poorest boy has the opportunity to reach the highest position in the gift of the people.

The changed conditions brought about by the rapid progress in this country during the first half of this century emphasized the necessity of meeting these new conditions by a broadening of the field and operations of higher education. This change of sentiment led Congress to pass a second land grant act. The object of the first act, and of other acts passed about the same time, was to encourage "religion, morality and intelligence, as they were necessary to good government and the happiness of mankind." The second act was for the purpose of establishing colleges which should, "without excluding other scientific and classical studies, and including military science, teach such branches of learning as are related to agriculture and the mechanic arts, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." The new revelation did not annul the old; neither did the purpose for which the second land grant act was made prove in any way that the reasons for the first land grant act were not entirely valid. All that was good in the old remains, but much more has been added and has brought our educational system down to meet the needs of the people of this great country at the present time.

The Agricultural College, which I have the honor to represent, is a child of the new dispensation. It was established to give a higher education to the industrial classes of the State. It has a distinct field of its own, and is endeavoring to do its work well within its proper sphere. Its main purpose is to give a liberal and practical education

to those who expect to follow industrial pursuits. It endeavors to bring all that is good in science, invention and method to bear directly upon the work of the farm, the mechanic arts, and the home. It gives three four-year courses of study, besides a number of special courses. In the agricultural course it trains young men for agricultural pursuits, but it keeps in mind that, first of all, is the man himself; the man first and the farmer afterwards. In addition to the technical studies he is given a very thorough course in the natural sciences and their application to the particular work which he expects to follow in after life. In addition to this, he is given a good training in English, literature, mathematics, history and economics. He is introduced to the thought and history of the past and, as far as possible, is given that solid foundation which will enable him to think clearly and express his thoughts forcibly. As far as possible students are taught to appreciate all that is wholesome and good in country life, so that when they leave college they will enter upon their life work with enthusiasm and pleasure, and not with a feeling that they are "brother to the ox."

Our mechanical course prepares young men for taking up the work of mechanical engineering. It is a strong four-years' course and is designed to prepare young men for taking responsible positions in the great industrial world. With the rapid developments in electricity and steam power within the last quarter of a century, has come a great demand for men of skill and ability in these lines of work.

The character of the future citizenship of our country will depend almost entirely upon the future mothers and the homes which they will occupy. It is doubtful if higher education can render a more noble and better service to our country than to prepare the future mistresses of these homes for the high and responsible positions which they shall fill. The Agricultural College endeavors to do this. It offers to young women a four-years' course. This course gives considerable training in the natural sciences and their practical application to household duties. Cooking, sewing, art needle work, floriculture, landscape gardening, etc., come in as part of the industrial work. On the other hand, it gives a good course in art, and two years of free instruction on the piano to those taking the regular course. But back of this all is a strong course in mathematics, English, literature, modern language, history, chemistry, botany, physics, bacteriology, and such other work as is usually required for the B. S. degree. The object of the course is to make scholarly, cultured women, who are able and ready to meet the problems of every day life in a practical way, and to bring to the solution of these problems the best and latest that science and skill have to offer.

The Agricultural College stands for higher training in industrial pursuits. Human industry deserves the best that science or human intelligence has to offer. It is as possible to endow and equip members of society to be the captains of industry as of war. In an industrial age like the present it is as much a function of education to produce the man efficient in directing industry as it is to produce one capable of directing the spiritual life, or protecting the legal rights of the people. The mission of the Agricultural College is to prepare leaders of industry. It confines its work to this sphere and leaves to

the other institutions of the State the preparations for other callings and professions.

After the address of President Snyder the University Glee Club delighted the large audience by a song.

HIGHER EDUCATION, AS IT APPEARS TO THE BOARDS OF CONTROL.

THE UNIVERSITY.

COL. H. S. DEAN, ANN ARBOR.

Ladies and Gentlemen—Your genial and energetic Superintendent of Farmers' Institutes, Prof. Clinton D. Smith, without consultation, put me on the bills to speak upon the topic "Higher Education," and to tell you how it appears to a member of the Board of Control of the University of Michigan, and but for the care of the proof reader he would have conferred fame upon me by getting my name wrong in the despatches. I beg to assure him, however, that he is forgiven, and to say to you that you are peculiarly fortunate in securing so amiable and able a superintendent.

As I contemplate the school system of Michigan my heart swells with pride. We all have a just pride in this great State of ours. We are proud of her intelligent and thorough-going farmers, her rich and diversified soil, her mines of iron and copper, her factories, charitable institutions, but above all we are proud of her schools, the crowning glory of which are her institutions for higher education, where the poorest boy or girl in the land can secure the inestimable blessings which they confer.

For these the people of Michigan are indebted to the noble and sturdy men who laid the foundation stones for this great State. While it was a wilderness, and they were battling with the hardships and privations incident to pioneer life, they made provision for the higher education of their children. In the organic act of our commonwealth they established and provided for the government of a State University.

If any one should ask, Are the sons and daughters of Michigan worthy of such sires? I would invite him to look at this great institution devoted to higher education, for which they have so generously provided. If that did not satisfy such a doubting Thomas, I would squelch him by asking him to take a look at the sons and daughters themselves.

Michigan stands before the world second to no state in this glorious Union of ours. That she occupies this proud position is due to the fact that her people have always kept her educational institutions in the front rank. That they have had the wisdom to do this is due to that other fact, that our fathers provided means for the education of their sons and daughters, and I predict that as long as they walk in the footsteps and follow the example of their forefathers, so long will Michigan remain in the front rank of states and continue to occupy

her present proud position, viz.: A State known through her institutions for higher education by every civilized nation on the face of the earth.

THE STATE NORMAL SCHOOLS.

PROF. E. FINLEY JOHNSON, ANN ARBOR.

With reference to the Normal Schools and what they are doing for the educational welfare of the State, I desire to say that we have three so-called Normal Schools in this State—one located at Ypsilanti, one at Mt. Pleasant and one at Marquette. In these three schools instruction is given to about seventeen hundred earnest and enthusiastic young men and women, who are there primarily for the purpose of preparing themselves for the profession of teaching. Michigan was the fourth State of the Union to provide schools for the special training of teachers, and the Normal School at Ypsilanti was the fifth school of its kind established in the United States. While it was fifth in point of time, I believe that it is now ranked among the first in character and quality of work done.

During the last session of the Legislature I had occasion to investigate the question of how many of the graduates of these schools taught in the schools of this State for one term or more after their graduation, and I found that about 96 per cent of them did. Not only did I find that 96 per cent of them went into the profession for which the State had given them special training and instruction, but that 80 per cent of them went into the rural schools and into the grades in the cities and villages. So, gentlemen, you can see that the result of the higher educational training and culture for which the State has paid, afforded by these schools, is returned directly to the source of the demand for thorough scholastic preliminary training. And we must remember that without a proper preparation and a thorough training enforced in the rural schools and the grades, it is impossible for the University and the higher institutions of learning to maintain the high scholastic position which they have reached.

It is the special function of these Normal Schools to train expert teachers, and while this is being done, it has not been forgotten that special academic training on the part of the student is a necessary prerequisite to the proper performance of this special purpose.

Recently all the educational interests of these schools have been put under one general control—under one president. Formerly they were under separate management, each attempting to work out certain problems without reference to methods and results obtained in the other.

Those who have given most thought concerning the advisability of this new scheme believe that the money which is to be expended in these institutions may be more wisely used under the new management, and with less duplication of expenditure. They also believe that there may be less duplication of labor, and that a sub-ordination of the courses of instruction may be enforced which will in the future

lessen the necessity of a multiplication of the ways and means for the expenditure of the people's money.

The fact that all the higher educational interests of the State were not originally placed, as the branch of the Legislature intended in 1848, under the management of one governing body, I regard as unfortunate, from the taxpayers' standpoint especially. I am sure that much money could be saved to the people if the responsibility of its expenditure could be more centralized.

THE AGRICULTURAL COLLEGE.

CAPT. E. P. ALLEN, YPSILANTI.

An abstract of Captain Allen's witty and timely address follows:

The medical schools train physicians, the College of Law develops lawyers, the Normal Schools train teachers, the University prepares men and women for mercantile pursuits, but the Agricultural College takes young men and women from the farm and trains them to keep the other classes from starving. Forty-two years ago I went to college at that institution. The first proposition given to me was to cut down a certain white oak tree. Then we set out an apple orchard, and the season being wet, we had to set it out in the mud. I mention these things because, whatever other changes may have taken place in that institution, its guiding principle from that day to this has been to teach young men to work, and to do well whatever is to be done. Today they do not set out orchards in the mud, and are more philosophic and scientific both in method and instruction, but the guiding principle is still the same, bringing out the entire man, body, mind and soul, and training all faculties for an active, intelligent participation in the world's work. Obedience to this fundamental principle has placed M. A. C. at the head of the list of agricultural colleges in the Union.

It has furnished teachers for nearly all the other agricultural colleges, and presidents for many of them. The Experiment Station, which is one department of the College, is in the front line of the stations supported by the general government. A history of the growth of the institution is a guide to the advance of agricultural knowledge.

The day of drudgery, drudgery pure and simple in farming, is passing away. In that vocation, as in all others, the highest attainments do not necessarily go with sixteen hours' labor and six hours' sleep. The gist of agricultural teaching is how to do better work, with more time left for thinking, and even for pleasure.

There is, and can be, no warfare between our great educational institutions. They are all of them engaged in educating our children to make them better citizens; the underlying principles of all this education is liberal. We can pay for schools better than for prisons. Michigan today is first in Normal Colleges, first in Agricultural Colleges and first in Universities because the men who settled this commonwealth came with a thirst for more knowledge and laid broadly and wisely the foundations of our educational institutions. In the ordi-

nance of 1787 we find these words: "Religion, morality and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged."

It is therefore a joy to me to take my place for a time in the Board of Control of the Agricultural College, and to speak on this platform in favor of the grand work the institution is doing.

WEDNESDAY FORENOON.

LESSONS OF THE YEAR IN WHEAT GROWING.

A. M. BROWN, SCHOOLCRAFT, KALAMAZOO COUNTY.

Mr. President and Fellow Farmers—When Superintendent Smith asked me to formulate some new ideas on the subject of wheat growing, I was reminded of the story of the boy who was asked by his teacher to write an account of the voyage and discoveries of Columbus, and to make it wholly original. The lad's composition, when completed, ran something like this: "Christopher Columbus was a Jew peddler, and he set out to find a new world in order to have a better market for his old clothes. He made a boat out of birch bark and used a second-hand linen duster for a sail. In three months' time he reached America with his cargo of old clothes, and thought for sure he had struck a bonanza, because he observed that the people were naked His disappointment was unutterable when he discovered that they preferred a string of glass beads to a pair of pants or an overcoat." I very much fear that originality and novelty of this striking sort will not pass current in this body. The subject, however, I think you will all agree, does not offer a very broad field for fresh discussion. I can't remember when I have heard a really new and practical idea put forth in regard to growing wheat, and yet this is one of the great agricultural interests of this country, aggregating a value of from two and one-half to four hundred millions of dollars, and it is one of the principal crops raised by the farmer of Michigan, the one to which he looks chiefly for ready cash when he seeks to lift the mortgage or build a new barn.

In the earlier days of the State's history, virgin soil meant a bountiful wheat crop, and a bountiful wheat crop meant a full pocketbook. But, my friends, new elements have entered into the problem since that time, and we now have on the one hand the sharp competition of the great Northwest, with its boundless areas of fertile soil, where wheat can be produced at a minimum of cost; and on the other hand a depleted soil, rendered so by an irrational system of skin farming, based on the notion that the chief factors in wheat growing are plowing and sowing. Under these circumstances it may be well, in the slang paraphrase

of the words of the illustrious Webster, to look about us and see "where we are at." It costs something to raise wheat; it costs something even to go through the motions without raising any, as some of you have had reason to know the past season. Possibly if we knew what it costs, or if we stopped to consider what it costs, some of us would decide that in our individual cases we can not afford to raise wheat at all—a most rational and wise conclusion, in my judgment.

When, in 1893, the government at Washington sought to find the estimated cost of raising an acre of wheat in the different wheat-raising states of the Union, it appears from the reports of the farmers of Michigan that the average cost of raising and marketing an acre of wheat in this State was $13.83. Of this amount $2.86 is charged to fertilizers. The average yield in Michigan the same year was 13.2 bushels, and the average price in Chicago 57 cents. Under these circumstances the value of an acre of wheat, considering the grain merely, is $7.52 only, requiring that the farmer should be able to realize $6.31 per acre out of his straw in order to come out even. Today the price is somewhat higher and the same acre of wheat would be worth $9.24, but even then there is too much difference between cost and value, in favor of the former, to permit the business to be profitable, unless we apply the logic of the lady who, though keeping boarders at a loss to herself of a dollar apiece per week, thought she should get on all right if she only had enough of them.

It is not possible, I think, to materially cheapen the cost of production. The only avenue to reform, then, lies in increasing the yield. Here surely is an ample field for effort. At this point I want to lay down the paradox that plowing and sowing are the least important elements in wheat raising; fertility of soil is the great desideratum. If there is abundance of water in the well, any kind of a bucket or pump will bring it up, but if the well be dry, all the pumps of the universe, though they have glass cylinders, globe valves and ball-bearing handles, can't raise a drop. You say, perhaps, that all this is mere commonplace; we knew this long ago; there is nothing new about it. Then why do you not put it into practice in your business, you farmers who are raising an average of only 13 or 14 bushels of wheat per acre? I see every year men plowing and fitting land for wheat, on which the ordinary weeds of commerce fail to grow; land barren of everything except the evidences of the last crop failure. I suppose that such must be depending upon the Biblical promise of a seed time and harvest, but I want to say that in this case the harvest will be very largely a pantomime.

The past year Michigan, in common with many other of the winter wheat states, suffered from a serious failure of the wheat crop, due chiefly to two causes—"winter killing" and "Hessian fly." The very severe cold, with little snow, caused deep freezing of the ground, a condition that was aggravated by heavy rainfalls before the frost was out, thus filling every depression with water that remained on the wheat for a considerable time. At the opening of spring the wheat, already weakened by previous unfavorable conditions, its roots more or less heaved out by the frost and its top largely dead, was subjected to further injury from a period of dry weather, when it was most in need of an abundance of rain. Yet its cup of bitterness was not yet full, for the Hessian fly opened its campaign at about the usual time,

and many a field, that had survived all the other disasters and gave promise of a fair crop, succumbed to the ravages of this unconquerable pest. It is not strange, in the light of all this, that the wheat crop of '99 in Michigan was very largely a failure. The wonder, perhaps, is that we had any wheat at all, yet there were a good many fields of quite good wheat. It is from these that we must seek to learn our lesson. In so far as these endured and survived the unfavorable conditions to which I have alluded, was it due to the variety of wheat, to the time of sowing, the depth of plowing, the degree of cultivation, the amount of humus in the soil, its fertility or its mechanical condition, or to all of them combined? To my mind the favorable results were very largely due to three of these causes, viz., mechanical condition, humus and fertility, and I will say a few words about each. I have long thought that a wrong impression has prevailed in regard to the preparation of the ground for a wheat crop, especially in heavy soil. Farmers have been advised over and over again, and the agricultural papers have reiterated the advice, that the seed bed for wheat should be made very fine and the soil beneath very firm. There should be much cultivation with fine-toothed tools, much rolling and planking. In fact, the surface should be in condition for planting onions, and the lower soil rendered nearly as firm as before it was plowed. Now let us look at this from a common sense standpoint. The conditions above described are quite ideal for the growth of wheat in the fall, but we forget that these plants must live through the winter, and we must have regard for those conditions that will mitigate somewhat the severe trials that may come to them during this season.

When we have this smooth, fine condition of the soil, and especially where it is deficient in humus, and has the under stratum well packed, we may expect deep freezing and later on root heaving, with its fatal results to the plant. The freezing is facilitated by the greater tendency for the snow to be blown from this smooth surface.

My experience has taught me that a different course of preparation is much safer upon heavy soils. I prefer to leave the soil much looser, with the surface more uneven. If there are lumps I would not crush them entirely. They are a protection which you can't afford to lose. As the cold weather comes on, this more open, porous condition of the soil will resist freezing, and during the early spring months, when there is much freezing and thawing, the lumps will gradually slake and carry soil over any roots that chance to be exposed, thus minimizing the damage done by the winter. I have seen fields lying side by side, quite uniform in other respects, but having been prepared according to the two differing methods suggested above, show most wonderful differences in the crop, solely, as I believe, because the mechanical condition in the one case prevented winter killing.

I think the experience of the past year will add still stronger proof to the correctness of this theory, if, indeed, it may be called a theory at all.

We suffer much loss to the wheat, as well as many other crops, from a lack of sufficient humus in the soil. This is a disadvantage in two respects. First, the soil that is barren of humus freezes much deeper, and, second, such soil gives off its moisture much more rapidly in dry weather. You are all aware of the resistance to freezing offered by a mucky soil, in whose composition is contained a large amount of

vegetable matter, and such soils yield very slowly to drouth. We may lay it down, then, as a settled fact that for the wheat crop, more than for many others, it is essential that there should be plenty of humus in the soil, for in this case it serves a double purpose.

We have thus far touched upon two of the three elements that were mentioned as prime factors in contributing to the success of such fields of wheat as produced a reasonable crop the past season; but by far the greatest and most essential of these is fertility, proper available plant food. It is the alpha and omega of the whole subject. Though we have all else and have not fertility, it shall profit us nothing. It is a panacea for all the ills of plant life, and the wheat plant is far from being an exception. It is the best offset to the ravages of the Hessian fly, because it makes vigorous plants that keep throwing up new shoots as the others are destroyed. It likewise prevents winter killing by making a strong plant with plenty of root in the fall; and, best of all, it makes a wheat crop at the other end of the season.

Now, fellow farmers, while it may have been possible, in the early days of the State, to put half the farm into wheat each year and get a crop, yet that day is passed and you must raise less acres and more bushels on them. Some of you who live on light, sandy land must stop raising wheat entirely. You can't afford to continue doing so on that kind of soil. Many farmers on such land have brought their entire crop to market this year in a single load, and that a small one. If the raising of wheat is to continue in Michigan, it must be confined to the more fertile lands and there carried on intensively. I know from my own experience that you can not expand your acreage beyond a certain point without correspondingly diminishing the yield. For a considerable number of years I maintained an average yield of better than 25 bushels per acre, but on increasing the number of acres my average dropped off materially, reaching the lowest point it has ever been at this last season, viz., 15 bushels per acre. My own experience the past year also emphasizes the value of clover sod for wheat, regardless of other conditions. Twenty acres of the poorest land I have was in clover in '98. The crop was cut and then the field put to wheat. This year there was a bountiful growth of straw and a fair yield, which would have been much larger had it not been for the rust.

I have said nothing concerning varieties, nor do I think it worth while to discuss this point. There are always enough valuable sorts to fit the requirements of the different soils and each person must make his own selection. Few kinds will do well on a really poor soil and few will fail on a good one, yet there are some leading varieties that merit popular favor, such as the Fultz, Lancaster, Nigger, Golden Chaff and Clawson, both red and white.

There has been so much damage done to wheat of late by the Hessian fly that I want to say just a word about it. I have been asked several times during the progress of these Institutes if there were not some practical remedy or preventive measure to be taken against the ravages of this insect, and I have been obliged to say that my experience indicated that there was no direct means of prevention, and that I had never heard of any that was effectual. I have no faith in the common notion that this pest can be avoided by late sowing. This very fall the first piece of wheat that I sowed was free from "fly," long after many others that were sowed much later were badly infested. When the

weather becomes suitable for sowing wheat, as it usually does about September 10th, I would sow it, and, if the soil be fertile and in good condition, the wheat will be much more likely to survive the ravages of "fly" than as though it were sown so late that it made but little root in the fall, and consequently could offer but little resistance to hardships of any kind.

In conclusion, I want to reiterate what I have said before by cautioning you against being over-nice in the preparation of your ground for a wheat crop; you can easily overdo the matter and make your labor a positive damage. Rather spend your surplus ambition in improving the fertility of your soil; rather direct your attention and energies to raising more clover or other legumes or drawing more manure, more especially the former.

The logic of the deacon in that familiar poem of "The One-Horse Shay" is wonderfully applicable, "make the weakest spot as strong as the rest." It is easily within the range of possibilities to increase the average yield of wheat in Michigan 50 per cent, but it can only be accomplished by more intensive farming, such as has been applied to other branches of agriculture.

DISCUSSION.

Q. How do you get humus into the ground?

A. M. Brown: By plowing under all surplus herbage. Humus is vegetable or animal matter undergoing slow decay. Rather than burn the straw therefore, if there is not sufficient stock to use it up as bedding, I advocate spreading it on the ground at threshing time and plowing under. We grow legumes to furnish nitrogen and aid in furnishing humus.

Q. What time do you sow clover seed?

A. M. Brown: In August, just before the fall rains, or in the spring. If the latter, we sow alone without a nurse crop, and cover with the weeder, which covers the seed but lightly. Our best results are with spring sowing.

Q. How will the rotation of clover sod, beans and wheat do? Will the soil improve?

J. D. Towar: We do not raise beans in that rotation, but I think the results would be good.

Q. Does Mr. Brown leave the straw on the ground until spring and then plow under?

A. M. Brown: Yes; I plow under the straw at that time and put into corn.

LESSONS OF THE YEAR IN GROWING CORN.

E. A. CROMAN, GRASS LAKE.

You ask me to give my experience for the year in growing corn. I want to go back a little further and tell you what I have learned in the past ten years. In that time we have had drouths and wet seasons, clover sod to plant on and no clover sod. We have had to substitute some kind of green manure to make humus and retain the fertility. In all these years the best results have been on clover sod, with a covering of barn-yard manure during the summer and early fall. The next best results have been on corn ground sown to rye and not pastured in the fall but left to grow and make as much top as possible and then plowed under the same as you would clover sod.

THE SELECTION OF SEED.

We select seed direct from the stock before cutting. This enables us to select from stalks that are straight and if possible that have two ears of good medium length. We select as soon as the ear gets well dented. Tie ears together and hang up to cure.

PLANTING.

We begin about May 15th. We mark three feet eight inches each way and plant with hand planters.

CULTIVATION.

We begin as soon as planted. If it looks like rain we run the harrow so as to have all that is planted harrowed before it rains. Our reason for this is that in planting with a planter there is always left a small hole, and the rain runs in and a crust is soon formed. If not harrowed before it rains, the harrow is more liable to knock out the corn. We use the harrow continually until the corn gets to the height of three or four inches, and then start the cultivator, and one that has very narrow teeth, and continue to cultivate, we might say, until the corn is ready to cut. As we do not let our corn ground lie uncovered through the winter, we either sow wheat or rye the last time through.

CUTTING.

We begin as soon as corn is well dented, putting 49 hills in each shock, and begin husking as soon as corn is fairly cured.

CARE OF FODDER.

We draw direct from the field to the shredder and run the shredded corn stalks into a large mow. If we can get the shredder and husker early enough, we let the husker do the work. This we can not always do, so we start husking by hand and generally finish with shredder and husker.

DISCUSSION.

Q. What are the advantages of fall plowing?

E. A. Croman: I have never seen any.

Q. Did the seed corn ever fail if gathered before frost.

E. A. Croman: No.

Q. What soil should be fall plowed?

E. A. Croman: Theoretically, the stiff clay; but I have never seen cases where I thought fall plowing was advisable.

Q. How about shredded fodder? My stock eat it when first shredded, but refuse it after it has lain in the mow.

E. A. Croman: The first year I threshed the corn the results were somewhat unsatisfactory, but now I could not get along without the shredder. I cut the corn when glazed, put it through the shredder and husker, and run the stalk into a bay, forty-two by nineteen by twenty. It heats, but I let it steam. It comes out in good order. The trouble generally is that people do not put enough of it together and pack it. They are afraid to let it heat.

E. L. Lockwood: While poor silos and poor silage may stand in the way of dairy advancement, we must in the end come to the silo as the proper storage place for the entire corn crop. You can build a good silo for 60 cents a ton capacity. I have built a 150-ton silo with stone foundation for $90.

Q. Where clover won't grow can we sow rye?

E. A. Croman: Yes, either rye or oats and peas. I prefer oats and peas, and shall grow a good many acres of them this year. It is the best substitute for clover in my opinion that we have at hand. Where the farmer has no money to put into a silo he may get some of the advantages by cutting the coarse feed, putting it into boxes with fairly tight covers, and letting it warm up, moistening it, of course, and mixing the grain ration with it.

RESULTS OF EXPERIMENTS WITH LEGUMES.

PROF. J. D. TOWAR, AGRICULTURAL COLLEGE.

To the German scientist, Helriegel, who began his investigations forty years ago, resulting in the important discovery in 1888 of the importance of legumes in appropriating atmospheric nitrogen, the world owes a great debt of gratitude. As early as 1865 he discovered the fact that certain legumes were capable of accumulating nitrogen from the air, but not until a careful experiment with sterilized soil possessing all the elements of fertility except nitrogen and planted to seeds of several families of plants, did he discover that the Leguminosae were capable of living, growing and maturing ripened seeds with no other source of nitrogen than that of the atmosphere. It was about this time, also, that the discovery was made that it was through the small nodules or tubercles on the roots of the legumes that this atmospheric nitrogen was appropriated. Since Helriegel's important discovery the study of root nodules of the legumes has been very active and extensive. In soils rich in nitrogen it is discovered that only few of these nodules appear. It is furthermore learned that for the development of the root nodule it is necessary that there be in the soil

the bacteria which develop the root tubercles. Experiments have proven that in the absence of these bacteria, even with all the elements of plant growth except nitrogen in other forms than that of the air, the legumes will even then refuse to grow. This experiment has led to the practice in some places of inoculating the soil where the particular legume crop has never, or not for a long time, been grown, in order that the development of the root nodules may be encouraged. An enterprising German scientist has even gone so far as to prepare and offer for sale a bacterial culture known as "Nitragin," which, if applied to the seed, will introduce into the soil the necessary bacteria to encourage the assimilation of atmospheric nitrogen.

Lawes and Gilbert early observed that the wheat crops following clover were always larger than when they succeeded any other crop. These investigators reasoned that the clover roots, stubbles and dry leaves left more fertility in the soil than was removed in the clover crop. One of their early experiments was on a field which had grown six successive crops of cereal, and then divided into halves, the one half growing barley and the other clover. After these crops were harvested analysis of the soil showed it to contain on the barley ground .1416 per cent nitrogen, and on the clover stubble .1566 per cent nitrogen, an increase of over 10 per cent in favor of the clover. The crop following these was barley again, which yielded 33 bushels per acre on the barley ground and 58 bushels per acre on the clover stubble.

LIST OF LEGUMES.

The family of Leguminosae is a very large one, including many cultivated farm crops, shrubs and trees. Those with which we are most familiar are the clovers—red, mammoth, alsike, crimson, white and yellow; bean and peas, including all garden and field varieties, cow peas, soy beans, velvet beans, etc.; vetches—sand, winter or hairy vetch, and tares; lupines—blue, white and yellow; lucernes—alfalfa, sand lucerne and the lucerne rustique; serradella fennugreek, etc. The root nodules mentioned above can usually be found by carefully lifting any one of the above growing plants, taking pains not to strip off the nodules as the roots are pulled out of the ground. The nodules appear in various forms, sometimes in clusters, others growing tightly around the roots like beads on a string, and others as large, warty-like growths at the extremities of the rootlets.

TEST OF VARIETIES OF CLOVER.

Four varieties of clover have been tested the past year on the College farm, including the alsike, Russian, medium or June, and mammoth. The seed was sown as a single crop, given entire possession of the ground, and cared for during the summer by simply mowing twice with a mowing machine, the knives set high, to keep down the growth of weeds. The clover catch was perfect and the resulting crop was as follows: Alsike, 5,264 pounds; Russian, 4,144 pounds; June, 3,600 pounds; and mammoth, 3,260 pounds per acre. While these figures may not warrant the drawing of a conclusion as to the best variety, in accordance with this experiment, the fact that this method of seeding resulted in a perfect catch and a satisfactory crop recommends this system of seeding.

CRIMSON CLOVER.

This new plant, owing to ignorance of its characteristics and adaptability for agricultural purposes, has many times been misappropriated, causing serious disappointment and financial loss. It is, in fact, an inhabitant of a more southern climate than this, and in its present condition cannot be at its best on a Michigan farm. As a hay or pasture crop there is not much to recommend it. Inasmuch as in the form of cured hay there is some danger in feeding it, and as a pasture crop there are so many other plants that are its superior, it is not desirable for that purpose. Its true function is that of a catch and cover crop. It may be sown in the spring and will give a reasonably good growth the first year, but will generally be killed through the winter. Its main use is as a catch crop, to be sown in the orchards or any other ground on the farm or garden that may become vacant after the middle of June. It is usually sown during the month of July, with the hope of fall growth only. If by chance, however, the winter favors its living over, it will make a good growth in the following spring, maturing its seeds by the middle of June. Should one be successful enough to get a good spring growth and mature crop, it is possible to grow his own seed by harvesting and threshing as we do the red clover. The roots of the crimson clover do not penetrate so deeply as do the other clovers, and it is, therefore, a surface feeder, the roots developing a great number of nodules and the accumulation of atmospheric nitrogen is very rapid. The New Jersey Experiment Station from analyses of the crop at various periods obtained the following results:

A crop six inches high, harvested April 24, contained 103.7 pounds nitrogen per acre.

A crop thirteen inches high, harvested May 12, contained 168.3 pounds nitrogen per acre.

A crop in bloom, harvested May 24, contained 189.6 pounds nitrogen per acre.

A crop mature, harvested May 31, contained 212 pounds nitrogen per acre.

While some of this nitrogen may have been taken from the soil, and in all probability was, it is safe to assume that a very large amount of it was obtained from the air, and as such is a clear gain. At 12½c a pound, a very modest price, the 212 pounds of nitrogen would be worth $26.50, while the other elements in this crop of clover would return a very considerable amount of plant food to the soil if used as green manuring.

ALFALFA.

This plant is cultivated largely in the west, and is especially adapted for deep soils, where the water is a considerable distance from the surface. It has long, strong roots, which go down far enough into the soil to draw up sufficient moisture to maintain growth, even in the dryest period. It has attained its greatest prominence, however, in the irrigated regions of the West, though the success with which Mr. H. D. Watson, of Kearney, Nebraska, has cultivated this plant without irrigation is something marvelous. Alfalfa thrives well in New York state on heavy clay, where it yielded an average of five and six-

tenths tons of cured hay per acre for three years. A New Jersey experiment announces a growth of 22½ tons of green feed, equal to six and two-thirds tons of cured hay per acre. It has been grown with success in Michigan, but the fact that it has not yet replaced red clover still remains. Perhaps the fact that the Michigan farmer is unable to raise the seed of alfalfa with profit has stood somewhat in the way of its introduction here. It has, however, the quality of remaining well in the ground, and is not run out as quickly as the red or mammoth clover. Objection is often made to it as a hay crop, which objection is probably due to the fact that sufficient care has not been exercised in handling it. It must be cut just at the right time, and if allowed to mature a day more than it should its feeding quality is seriously impaired. The stems become woody, the leaves drop off, and the feeding quality is practically destroyed.

SAND LUCERNE.

Sand lucerne is a plant resembling alfalfa so closely that only the careful botanist can discern the difference. Its scientific name is medicago media, while the alfalfa is medicago sativa. It has been growing on the experimental plats at the College since 1897, producing four cuttings in 1898, amounting to 8,480 pounds of cured hay per acre, and four cuttings in 1899, producing 10,580 pounds of cured hay per acre. The roots of this plant are strong and woody and penetrate to the depth of several feet into the soil. We removed one last year to the depth of seven and one-half feet, at which point it was about three-sixteenths of an inch in diameter. This grew on very light sand soil, which for growing ordinary farm crops is the poorest on the College farm.

COW PEAS.

This is a Southern plant, but it is being slowly acclimated to Northern altitudes. We already have several varieties that will ripen their seeds in Michigan, the most promising of which are the early Blackeye, the Mount Olive, the Red Ripper, and the Warren's Early. It is our observation that as they are made accustomed to the Northern climate and encouraged to ripen their seeds, the general growth of the plant is somewhat stunted. If one wishes to grow cow peas for green manuring and soil renovating purposes, it would be better to procure seeds of the Clay, Whippoorwill and Wonderful varieties, without hope of maturing seeds, purchasing the seed from the far South. We raised cow peas in 1899 at the Experiment Station, though the yields were extremely low. The Blackeye variety produced 9,600 pounds per acre, which upon analysis showed the presence of 62 pounds of nitrogen. It is safe to say that had the season been a normal one in the matter of rain during the growing season of this crop, the yield would have been doubled. It should be understood that cow peas are very tender plants, and must be grown between the periods of spring and fall frosts, for they succumb at the earliest approach of freezing weather.

SOY BEANS.

These are sometimes called soja beans, either of which names seems to be equally proper. The soy bean grows similar to the cow

pea, except that the stalks stand more erect, the plant will endure colder weather, and nearly all of the varieties will mature in Michigan. This plant lays claim to some considerable value as feed, it being rich in protein. In Kansas it is used largely to balance the feed rations which are made up so largely of corn. The cow pea in the South is made into hay, and baled as we bale our timothy and clover. As such, it makes a quality of hay thoroughly acceptable to animals which are accustomed to eating it.

On the whole, legumes demand a place on every farm, in every orchard and every garden. As feeds they are rich in protein, the most expensive food material the farmer has to provide. Their manurial value is high, owing to their rich content of nitrogen, which is also an expensive element in our commercial fertilizers. No rotation is complete without a legume, and no farm is properly managed which does not grow clover.

DISCUSSION.

Q. How much sand lucerne do you sow per acre?

J. D. Towar: I should say about the same as clover, from ten to fifteen pounds per acre. Remember that the crop is especially adapted to light sand. Sow in the spring without nurse crop. Run the mower over the piece two or three times the first summer to cut down the weeds. The periods of cutting will thus have been approximately May 31, July 3, and a later cutting in August and September. It seems to be hardy and withstands our winters better than clover. It is a perennial.

Q. Is it adapted to clay soil?

J. D. Towar: We have not tried it on heavy soil. Sow the seed about as clover, and as late as need be as the first or middle of May. I think it would withstand pasturing. Its root is well in the ground, although the crown is half an inch above the surface. It has a strong tap root, and might be somewhat hard to plow up for that reason. It is a true legume, and has abundant tubercles on the roots.

Q. What is the value of cow peas as hay?

J. D. Towar: I do not know as a matter of observation, but it is used very largely in the south for that purpose, and with good results.

ROTATION OF CROPS.

A. E. PALMER, KALKASKA.

A systematic rotation of crops may not be a panacea for all the evils incident to Michigan agriculture, but it will go a long way in helping many of us out of difficulties which confront us in our agricultural operations. Too many of us, allured with the small amount of labor involved, have for many years been following a grain and grass rotation, i. e., wheat, oats and timothy, until we have reached a point on many of our richest lands where the crops refused to be remunerative because of soil depletion, and we are obliged to re-arrange our system of cropping or seek other locations.

Others of us have been adapting our crops to the basis of prevailing prices year after year, paying little or no attention to any particular rotation. This, too, has proven a loss of original capital, rather than a short road to wealth. Special crops alone, no matter how promising they may be, are not going to help us out of present conditions. Such crops should be handled with care. They are expensive to raise, because they demand the best land, intensive cultivation and most manures, at the expense of other parts of the farm, using only part of the farmer's capital (soil fertility), while a proper rotation would use all, with less waste and better results.

The length of a rotation is of less moment than the character of the crops making up the rotation. No uniform plan is adapted to all parts of our State, because of our widely different conditions—soils, markets and transportation charges. The peculiar environments and individual tastes of each farmer must decide for himself. It is the object of this paper to offer a few suggestions, which should be carefully considered before deciding upon the best form of crop rotation to adopt.

Light, sandy soils require a shorter rotation than heavy clays or rich, alluvial soils, but naturally rich lands which have been depleted in fertility by mismanagement may be most quickly restored to original conditions by a short rotation, and on any class of soils we take less chances of failure of crops with a short than with a longer rotation. However, science and the best practice seem to be thoroughly agreed that a rotation which includes the clovers, cereals, hoed crops and live stock may be safely adopted in any part of Michigan.

All farm crops are dependent largely upon the three principal elements of plant food, nitrogen, potash and the phosphates, but they differ widely in the amount of the different foods they take up, and do not use the elements in any like proportion. While the fruit tree or the potato plant draws largely upon the potash, the wheat and barley demand more of the nitrates and phosphates; hence it is not good policy that two such grain crops should follow in succession, preferably some other crop using largely that element of plant food not excessively used by the previous crop. So, also, two hoed crops succeeding one another has additional disadvantages, notably the bare ground of fall and winter, the danger of surface washing, the waste of nitrates resultant from

first year's tillage, when not followed by a crop having the ability to take up and use them.

Again, some plants have the power of taking up and storing plant food for future use. The clover and pea, while large users of the nitrates, can be most profitably followed by a corn or wheat crop, either of which require a large amount of this particular food.

Plants also differ in the length of their feeding roots. Some feed near the surface, others go deep into the subsoil, and it would seem to be good policy that a surface feeder should follow a deep feeder, and thus use all the soil.

The length of time necessary to mature crops varies greatly. Some use but a short time, others the entire season, and it is possible that there would be some advantage in the following of a short by a long-feeding crop. So, too, the methods of growing the crops should enter into our calculations. Some are cultivated, others are not. The corn crop has been properly called a fallow crop. In a well handled crop of corn we not only kill the weeds, but put the ground in excellent condition for a succeeding crop of wheat.

In a systematic rotation we are constantly changing our treatment of the soil, and do not give the weeds a chance to grow and mature their seeds as in case of repetition of same or similar crops, nor are we as likely to suffer from the ravages of insects and destructive fungus diseases, for the longer a field remains in one crop the more favorable it is for insects and diseases preying upon that particular crop.

In making up our rotation we should not forget that nature's method of furnishing nitrogen to the soil is through the growth of leguminous plants. I doubt whether we can improve upon nature's plan, and hence believe that no rotation is complete without at least one leguminous crop.

In a short rotation, some additional advantages accrue—for instance if it be corn, wheat and clover—in most conditions once plowing will answer—an economy of labor. So, too, machinery in this rotation assists us in being able to grow and harvest a large acreage with a minimum of hand labor, for each crop is out of the way of the succeeding one. Such a rotation necessitates more stock being fed upon the farm. This means more manure, more humus, better preservation of moisture, less danger from drouth, stronger plant vitality, richer soils. Any rotation suggests a better maintenance of fertility, more system in farm management, more even distribution of manures and tillage, and more steady employment throughout the year.

NEW HELPS IN POTATO GROWING.

M. L. DEAN, AGRICULTURAL COLLEGE.

To successfully grow potatoes of the best quality the soil should be a sandy loam, well filled with vegetable matter and worked to a fine tilth.

Clover is an ideal crop to precede potatoes. The ground should be plowed as early in the spring as practicable, thoroughly worked till planting time, which should be about May 1st for early and June 1st for late sorts.

Coarse manure should not be applied, because it has a tendency to dry the soil and also promotes the growth of fungus diseases.

Mark the ground with furrows four to five inches deep and three and a half feet apart. Drop and cover the seed with three to four inches of fine soil.

The seed should be selected at digging time, from hills that are the most productive of uniform, medium-sized tubers.

Great care should be given the seed to preserve the vitality, by preventing the tubers from sprouting. This can be done by burying the seed safely from danger of frost, in pits on the north side of buildings or by keeping it in cool damp cellars.

Before cutting the seed it should be soaked 60 to 90 minutes in a solution of corrosive sublimate, two ounces to sixteen gallons of water. The solution should never be put in metal receptacles, but a barrel or tub can be used. Place the potatoes in a burlap or coarse sack and suspend them in the solution the desired time.

A medium-sized tuber cut twice lengthwise and one piece in each hill generally gives the best results.

To aid in the growing of strong, healthy vines, and as a preventive against the attack of tip burn, early leaf blight and true potato blight, the vines should be sprayed with Bordeaux Mixture several times during the growing period. Paris green can be added for combating the Colorado beetle.

Thorough, shallow, level culture should be strictly adhered to. Planters or diggers are not practical except where potatoes are grown on a commercial scale.

DISCUSSION.

Q. How do you prepare the soil for the potato crop?

M. L. Dean: Plow early, cultivate and harrow thoroughly, make the trenches six inches deep, cover at the outset three to five inches, cultivate level. If you plant in hills put the rows three feet apart, and the hills twenty-four to thirty inches.

Q. How much and what kind of fertilizers do you use on potatoes?

M. L. Dean: None directly on potatoes. I prefer to fertilize the clover, the sod of which is plowed under for this crop.

Q. How do you cut the seed?

M. L. Dean: Select medium-sized potatoes and cut into four pieces.

Q. How do you treat with corrosive sublimate?

M. L. Dean: We use a solution of two ounces of sublimate to sixteen gallons of

water, soaking from thirty to forty minutes. If the solution is too strong it will destroy the germinating power of the seed. We have discovered nothing better than this corrosive sublimate, and would soak the seed before cutting.

Q. How do you keep the seed from sprouting?

M. L. Dean: There is no better way of keeping seed potatoes than burying. If they are kept in a cellar they must be kept cool.

Q. Would you plant six inches deep on heavy soils?

M. L. Dean: No; three to five inches deep.

Q. Have you tried sulphur for scab?

M. L. Dean: Yes, but it is too expensive. I have never tried burning it in the cellar.

Q. How much seed do you use?

M. L. Dean: Where the potato is cut in four pieces we use two pieces to the hill. We cut seed to economize the cost, as the same amount of seed will plant more ground.

Q. What is your method of handling the solution for treating seed potatoes?

M. L. Dean: Put the solution in a wooden tub and suspend the seed in a burlap sack.

A Lady: I have treated seed potatoes as the College has recommended and have had very scabby potatoes at harvest. What is the reason?

M. L. Dean: I do not know. There are many places where mistakes could be made, and it is impossible to tell just where the given application of the method failed.

A Gentleman from Tuscola County: I planted a field of potatoes partly with treated seed and partly with untreated seed. Where the untreated seed was used 10 per cent of the crop was scabby; where the seed was treated less than one per cent was scabby.

Q. Can you grow a good crop of potatoes on a marsh?

M. L. Dean: You will get a good quantity, but the crop will be poor in quality.

A Farmer: I grow potatoes on a marsh, and we like them fully as well, if not better, than the same variety grown on upland. We manure the marsh in the winter; plant the middle of June. Last year we had 200 bushels to the acre. We practice covering the seed a couple of inches on the start, then deeper later. We do not hill, but practice level culture. The weeder is a very valuable implement for us.

WEDNESDAY AFTERNOON.

TOPIC—FRUIT.

QUESTION BOX.

Q. How ripe should peaches be when picked for market?

R. Morrill: They should be thoroughly ripe. Not too soft, but ripe enough to require good care to prevent bruising. For this reason among others, I have found the Michigan grader to be of little value.

Q. What is the cause of yellows?

L. R. Taft: The cause of yellows is not clearly understood. The remedy is to extirpate every afflicted tree by digging up and burning.

Q. Would there be any objection to sowing a peach orchard that has been cultivated during the fore part of the season to rape about July 1st, and pasture with hogs?

R. Morrill: The worst objection is that it prevents cultivation during July and early August. It is a good plan to sow later to a cover crop to keep the ground covered during the winter.

Q. Is it advisable to roll oat ground and potato ground after planting?

Prof. Smith: Our rule is not to use a roller at all in the spring if the ground is wet and composed largely of clay. Where the ground is very sandy or mucky and needs compacting, then the use of the roller is all right. On clay soils or clay loams,

and, in fact, on almost all kinds of soils, the roller should not be used unless it is followed at once by the spring tooth harrow.

Q. How does Mr. Morrill transplant his melon vines from hothouse to field? What variety of musk melons does he consider best?

R. Morrill: I transplant from a frame. Boxes made on purpose. These are filled with good compost, in which the seeds are sown thickly and thinned to one or two plants. The small boxes are hauled to the field and the plants contained are set out in the hills, leaving all the dirt in the frame box attached to the root.

There are two varieties of melons which may be used, depending on the market. The Osake is a good melon, large, with yellow flesh. The Netted Gem is also a good melon.

Q. How shall we check wood growth of the peach and what manufacture of nozzle is best for the use of Bordeaux?

R. Morrill: Cease cultivation and sow cover crop, the time of year of sowing depending on the age of the tree. The double Vermorel is the best for Bordeaux. The McGowan is not as reliable.

Q. What would you do with small green lice?

R. Morrill: Spray with tobacco water or kerosene and water.

Q. Is it true that horses having white feet or white faces, if pastured on alsike or fed alsike hay, will become sore on the white spot. At a one-day Farmers' Institute at Freeport seven farmers supported this statement.

Mr. L. D. Watkins: I do not think it can possibly be true; I have never known any similar experience.

Q. What value has hard coal ashes as fertilizer in apple orchard?

Prof. Taft: It has no value as a fertilizer, although it is good as a mulch.

Q. What variety of Blackcap would you recommend for family use?

J. N. Stearns: Kansas.

R. Morrill: I would recommend the Cumberland.

Q. How many peach trees do you have? How do you sell your crop? What variety of peaches would you plant?

R. Morrill: I have 100 acres of peaches in bearing. I sell part at home, but the bulk of the crop goes to Chicago. The varieties to be recommended are Engle, Lewis, St. John, Hill's Chili. The Fitzgerald is one of the best.

Q. If you cannot get wood ashes what form of potash would be the cheapest to use?

R. Morrill: I have always been able to get wood ashes.

Q. Does white arsenic or any spraying combination make grazing dangerous?

Prof. Taft: It might until after the first rain after the spraying, but it is hardly probable, unless an unusual and uncalled for amount of arsenic be used.

Q. Will it pay to draw sawdust on an orchard?

S. H. Fulton: I should hardly think it would; it would have little value except as a mulch.

Q. I should like to ask Mr. Stearns at what degree of ripeness he picks his strawberries for the Chicago market?

J. N. Stearns: It is difficult to describe.

Q. Is there danger of poison from eating fruit picked from trees affected with the yellows?

J. N. Stearns: No, a bushel would not hurt one; but no one will eat more than one or two because of the unpleasant taste.

Q. Can an old orchard which has been grafted to good fruit be brought to bear for a few years while a young orchard is being started? If so, how?

L. R. Taft: Yes; by judicious cultivation, pruning and spraying—supposing the fertilization of the ground to be cared for. Most orchards lack soil fertility, especially potash and humus.

Q. What shall we do with the tent caterpillar to destroy them on our fruit and forest trees?

L. R. Taft: Spray with arsenites.

Q. Will crimson clover live through the winter?

Prof. J. D. Towar: In favorable seasons in southern Michigan and where covered with snow. It is not safe to rely on it, however.

Q. How do you destroy the peach grub at the root?

A. S. Packard: Dig them out once a year.

WILL IT PAY TO SET APPLE TREES? IF SO, HOW TREAT THEM FOR PROFIT?

HON. C. J. MONROE, SOUTH HAVEN.

Mr. Chairman, Ladies and Gentlemen—One of the natural and most important productions of Michigan is the apple. It does fairly well in each of the 83 counties of the State, and in most of them, under very ordinary care, has yielded bountifully of apples of fair size, good form, color, and excellent quality. In quality it is generally conceded that Michigan has stood among the first. The wide territory over which the apple is grown, its variety of uses, and its long keeping in a fresh or natural condition, makes it the king of fruits. It brings health as well as wealth, having important dietetic advantages.

During the past few years frequent mention has been made of the decline in the orchards, the lessening yields, more irregularity in bearing, and the great increase of gnarly, wormy, scabby fruit, all tending to degenerate the quality.

In view of the above, the orchard and its fruit are deserving of more thoughtful attention.

The fact that a few in our own State, and many in others, notably New York, have produced the old-time quantity and quality, with even more regularity of crops, has emphasized the need of learning their methods and trying to induce the growers generally to apply them to their own orchards.

I know of no better way to accomplish this than by showing the money side, or that there is a profit in it.

I appreciate the difficulty of a very exact demonstration.

We have only meager statistics showing cost of land and its preparation, its rental value, the trees, the setting, and the after cultivation and trimming; the expense of fighting diseases and insect enemies of tree and fruit, also the cost of fertilizer, if used. The difficulty is further increased by the fact that from five to fifteen years intervene before any returns. In the meantime some farm crops are raised, and no account kept of them. In view of this it has seemed to me I could give a clearer idea of the value of the apple orchards by comparison with the wheat crop. This is chosen, not only because of being a staple crop, but the leading money crop since the settlement of the State.

In the fall of 1887 I collected the statistics of the fruit crop, including every sort, raised in the counties of Allegan, Van Buren, and Berrien. Values given are those which were realized at the station or dock, as the money paid out in raising, for packages, and in delivery to the station or dock was nearly all within these counties. No account was taken of the home consumption of the 23,000 families, whether used fresh, dried, preserved, in apple butter, jam, jellies, canned, or in any other form of keeping beyond their natural life. The prices given are the average taken from a large number of reports from buyers and sellers in different portions of these counties.

The report mentioned above is published in the State Horticultural

Society's report of 1888. That portion relating to the apple and its comparison to the wheat crop is as follows:

415,588 barrels at $1.65	$685,720 20
112,600 bushels evaporated, cost 20c sold	58,724 00
Cider, jelly, apple butter, pickles, preserved and canned, 313,200 bushels, cost 10c manufacturing and getting ready for market	109,620 00
	$853,364 20

The package is included in the above, as the material and labor were mainly within the counties, and fairly counted as income on account of the apples.

Wheat crop by State report October, 1887, in the three counties, 1,563,969 bushels; deducting 575,000 bushels for bread and seed (5 bushels to each of the 115,000 of population), and we have 983,969 bushels for market. Average price that year 73c, gives	$721,947 37
Or less than apple crop by	131,416 83

After the report was given 21,445 barrels were reported, but not included in the above.

As already stated, the wheat crop has been considered the money crop. In fact, for many years after the settlement of the State it was about the only crop sure to bring cash. This is probably the prominent reason for the preference given to its care over other crops. It had the most fertile fields, the ground most thoroughly prepared, the time of sowing and covering of seed received careful attention, its growth anxiously watched, no other work allowed to interfere with the proper time of harvesting, and that done by those who received from two to three times the compensation for other farm work. The threshing and marketing were done with more than ordinary care. In fact, from sowing to marketing, the most expensive machinery of the farm was used. In a word, while wheat stood first in the thought and practice of giving it all the attention likely to bring the largest income, the apple orchard was last. When first set the ground was poorly prepared, often among stumps, and having to contend with other crops for years. If trimmed, it was usually out of season and poorly done. If planted with a hoed crop, the trees were fortunate in being aided in getting a start. Too frequently grain was sown, taking the food and moisture at a critical time.

In many cases orchards were seeded down about the time they commenced to bear, and hay harvested, then frequently pastured with horses and cattle or other stock, the fruit given away liberally or gathered and marketed at convenience, and the money obtained used with the least thought as to getting value received.

From the above figures, and from observation in the banks, where we have paid out large sums for apples in the past thirty years, and, notwithstanding the preference given the wheat crop, I am satisfied that the apple has brought much larger returns per acre than the wheat. Hence, for a period covering the past generation there can be

no reasonable doubt that from a financial point the apple orchard has paid well.

It is also clear to me that there is nothing in the way of orcharding or farming that will bring such quick and large returns as the better care of the present orchards, especially those which have been set ten years or more, and which have been so neglected as to bring little or no return for some years. I am confirmed in this belief by a number of men in our State who have had annual crops for five years or more.

I will give two examples, both of which are within a day's drive of South Haven, and have been visited by many interested in raising apples that they might see for themselves the care given and learn personally of the results.

The first is that of Mr. Sherwood, near Watervliet. Its care and crops have been mentioned frequently in the past two or three years, and quite full statements published in our Horticultural Reports.

The second is that of Mr. F. Morley, which is about half a mile east of Fennville. I received from Mr. R. Morrill the following, 'phoned to him by Mr. Morley: Orchard, 18 acres, 15 in bearing; trees 33x40; set in 1873 on sandy loam, with clay subsoil. Original timber, pine and oak. For twenty-one years, or up to 1894, no mention made of any crop; since then cultivated and trimmed as well as his peach orchards (and this means the best); thoroughly drenched his trees three times each year with the ordinary Bordeaux formula; has had five successive crops, the smallest 600 barrels, the largest 2,500 barrels in 1896. This last year he sold his crop on the trees for $2,400, and the yield was 2,040 barrels. He has used but little manure thus far, but, if I understand right, intends to put on ten carloads of stockyard manure this year.

This is also confirmed by the experience of New York growers, who in the past few years, by good care of their orchards, have furnished abundance of proof in large annual yields.

In the main these results have been obtained by pruning, good cultivation, liberal fertilization, and three to four thorough sprayings at the proper time. Four years ago, at the meeting of the Western New York Society, held at Rochester, I saw several tables of fruit which were good illustrations of sprayed and unsprayed fruit; also, where every other row was skipped, compared with orchards with all the trees sprayed. The latter were the more perfect in form and the freer from diseases and insects. Each year I have made inquiries of residents whom I might meet, also apple buyers who have purchased fruit in that state. This year my old partner, Mr. S. R. Boardman, bought apples in Western New York. I addressed him a letter saying:

"I wish you would give me brief answers to the following:

1. Name of counties in which you bought apples (his purchases were confined to Orleans county).

2. About what proportion of the apples were No. 1?

Answer, three-quarters.

3. Did the majority spray?

Answer, yes.

4. What other methods did you observe to prevent insect depredations?

Answer, wire screen bands nailed around the body of the trees, left

flaring at the lower edge to allow insects to crawl up between the screen and tree, where they could be easily destroyed. Some use cotton batting, others wool, and in a few cases tar. Lighted torches at night were also quite freely used.

5. What proportion of their orchards were cultivated?

Answer, three-quarters. The larger portion of the other quarter were mulched, using a liberal amount of straw, and in some cases covering the ground four or five inches deep. A few do not cultivate, but use liberally of barnyard manure, potash and phosphates. He said the tendency was decidedly toward good cultivation as the best practice, besides furnishing less hiding places for the insects.

6. It is reported that many are cutting out a portion of their trees. About how far apart do they leave them?

Answer—They cut out in some cases full rows, in others diagonally through the orchard, so as to leave the trees from 40 to 45 feet apart. He stated that some trees had grown since thinning out so that their limbs touched each other."

I also arranged with a Mr. Bassett, of South Haven, who has purchased apples in Western New York for a number of years, for similar information. He very generously furnished me a large amount relative to the care of the orchard and its fruit, also a number of examples of the income of orchards from which he purchased the apples for several years. His statements substantially confirm those of Mr. Boardman.

From both these men and several others I am informed that farms ranging from 20 to several hundred acres, with orchards from 5 to 50 acres, have increased in the past few years $15 to $20 per acre; that the apple crop has furnished the principal money income.

While I am aware of many large crops and good profits from neglected orchards, it is certainly poor policy, and I believe each year will show more and more its unprofitableness. There are very few meetings held where some one does not claim to have an orchard or know of one, in grass which is doing as well as those upon which much time and money are expended. Those familiar with the monthly crop reports of the Secretary of State will recall similar claims. These reports and many items in the horticultural press have frequently claimed that the orchards in grass had survived the severe cold of a year ago better than those cultivated. While this may be true in some cases, it is misleading; that is, it gives the impression that, after all, it is not worth while to incur the expense of cultivating, trimming and spraying, and so these are neglected, to the loss of the owner and damage to the neighbors, whose labors are increased by the insects and diseases bred by the careless and indifferent grower.

The loss by freezing is usually due to leaving the ground bare, particularly on the knolls or high places where the snow and soil blow away, also due to the late growth stimulated by rains and unseasonable weather. Most of this can be obviated by stopping the cultivation early and sowing some cover crop. In light sandy or poor places the seed may not grow, so that a mulch of straw or coarse manure will be required.

There is a great variety of cover crops, among them crimson clover, rye and oats. Upon the average of our soils oats have been most satisfactory. They grow up quickly, holding the leaves and snow; dying down, they cover the earth with a mat which is easily cut to pieces in

the spring by shallow cultivation. The rye and crimson clover are usually left in the spring too late, robbing the trees of moisture, and leaving the ground, where plowed under, in a loose, undesirable condition.

After attending many meetings, and reading a number of fruit publications, I do not recall a single instance, verbal or written, where an orchard, or any sort of fruit plantation, has given satisfactory results, for a term of years, which has stood in grass, without cultivation, trimming, fertilization, or spraying. I have certainly never seen any figures to demonstrate their success.

On the other hand, in every sort of fruit-raising, and in every part of our country regarded favorably by natural or climatic conditions, there are numerous examples of success, giving cost and income, where up-to-date methods are practiced. It is easy to believe this must be the case, as such treatment comes under the well-nigh universal rule that success comes in any business or calling from careful attention to details. For years it has been demonstrated that all kinds of fruits respond to good care throughout the years. With an increase of diseases and insects this care becomes the more necessary, and whoever is not willing to do his best should refrain from setting an orchard.

As showing what a single tree may do, I ask attention to one mentioned by Mr. S. D. Willard of New York, at a farmers' club meeting, January, 1899. The tree was a Gravenstein on the farm of a Nova Scotia grower, with whom Mr. Willard said he was well acquainted. The record is as follows:

	Barrels.
1878	18
1880	25
1884	23
1886	24
1888	27
1890	20
1892	21
1894	26

This gives 184 barrels for eight crops, an average of 23 barrels, or an average of 11½ barrels for the 16 years. It is stated that the tree is about 40 years old, 18 inches in diameter, and has had extra care.

Having called attention to the single tree, I will mention the orchard of Mr. F. Wellhouse of Kansas, who is said to have the largest orchard in the United States, if not in the world, having now about 1,600 acres. His orchard began bearing in 1880, and is as follows:

	Bushels.
1880	1,594
1881	3,887
1882	2,027
1883	2,388
1884	11,726
1885	15,373
1886	34,909
1887	37,790
1888	20,044
1889	11,952
1890	79,170
1891	63,698
1892	Failure
1893	Failure
1894	47,374

The largest profit during any one year, as stated by Mr. Wellhouse himself, was the crop of 1890, of nearly 80,000 bushels. The actual expenses that year were a trifle more than $13,000, and the gross receipts

from the sale of apples were $52,000, leaving a net profit of about $40,000, a pretty good return for an ordinary farm in Kansas. The number of acres bearing in the foregoing statement were 427. Mr. Wellhouse also states that he sent 22 carloads of first quality Ben Davis apples to one dealer at one time. This gives a hint of the magnitude of some of the commercial orchards; also it is worthy of note that these large orchards usually have but few varieties.

By the Michigan census of 1884, compared with the farm statistics of 1898-9, we have the following:

	Acres.		Trees.		Bushels.	
	1884.	1898.	1884.	1898.	1884.	1898.
State	312,716	196,541	9,245,419	5,896,230	4,092,806	6,024,975
Washtenaw	11,861	5,542	380,635	166,260	185,110	128,909
Allegan	10,701	7,079	324,414	212,370	112,706	192,683
Berrien	14,356	6,979	468,379	199,370	209,011	126,282
Van Buren	10,997	6,486	337,054	194,580	140,778	154,577
Totals of last three counties	36,054	20,544	1,129,847	606,320	462,495	473,542

I have singled out Washtenaw county, as it is the one in which we are holding this Round-up. I have grouped Allegan, Berrien and Van Buren together, as they are the three counties used in my comparison of the apple and wheat crops.

There are about six millions of trees of an age, and mainly in fair condition, to do service for ten years or more. Had these trees received similar care and attention for the past two or three years as those in several of the western counties of New York, they would probably have produced the past season double the marketable fruit, and we should have obtained a net of two dollars per barrel on the tree, instead of about one dollar. From my observation and experience, and from personal and written information received from many others, I am convinced that there is no other farm or horticultural labor that in the next decade will bring such quick, certain and large profits as the proper care of these trees. By proper care I mean, without neglecting minor details, thorough and intelligent use of the "Big 4," cultivation, fertilization, trimming and spraying.

PRESENT AND FUTURE OF MICHIGAN APPLES.

S. H. FULTON, SUPT. OF SOUTH HAVEN FRUIT EXPERIMENT STATION.

Since prices are the controlling factor in the planting of fruit for commercial purposes, permit me at the outset to refer to this phase of the subject in hand. A great deal has recently been said and written in horticultural circles to show the profits of apple growing in Michigan, taking a term of years into consideration, so I will simply mention prices paid for last season's crop. I fully realize the difficulty, and in fact impossibility, of giving exact figures, because of the widely varying methods followed by growers in disposing of their crops. Many apples were purchased in the orchards by fruit buyers, some at so much per barrel, some by bulk, some by the lump or whole orchard; still others were delivered at the train, and some picked, packed and shipped direct to commission men and dealers by the growers themselves. However, a few figures may be given which will be some indication of the value of the crop.

Early in the season, during the month of September, apples were bought largely on the basis of one dollar a barrel for the fruit on the trees. Quite a large per cent of the orchards of Western Michigan especially were bought in this way. On board the cars prices averaged, so far as I have been able to learn,, about $1.75 per barrel. But the farmers who sold their fruit by the lump were the fortunate ones last fall. As a Chicago commission merchant expressed it: "The buyer was the one who was in mourning when the time came around for the apples to be picked." The long spell of warm weather which occurred caused the premature ripening and falling off of much of the fruit, and what was harvested was largely of poor quality. It was very difficult for any one, whether a buyer or a grower, to put up fruit satisfactory to the trade. Such was the general condition of the crop, but it is a significant fact that a much better class of fruit was harvested in the comparatively few orchards of the State which were well cared for. Buyers were quick to learn of such orchards and were willing to pay extra for them. Some orchards of this description in the Western part of the State sold at the rate of about $100 per acre.

As a further evidence of increased profits because of better care, we have the experience of New York State growers, who have for the last few years been paying more attention to the apple, and as a result are growing better fruit in general than heretofore. Last fall New York apples sold at a premium over Michigan fruit, and I have the statements of Chicago and Buffalo commission men that this was occasioned wholly by New York State growers having a better grade of fruit. The difference in price which existed has been variously estimated at from 75c to $1.25 per barrel in favor of New York fruit, and according to the most reliable reports which can at present be obtained, will probably average more than $1.00.

As an apple producing state Michigan ranks high in quantity of fruit produced. According to figures kindly furnished me by Wm. A. Taylor,

assistant United States pomologist, Michigan in 1888 took second place in yield among the apple producing states of the Union. The apple crop of Michigan that year amounted to 13,154,626 bushels. This yield was exceeded by a few hundred thousand bushels by that of the state of Ohio, and was followed by that of Kentucky, Illinois, Indiana, Missouri, New York and Virginia in the order named. At the present time, no very recent statistics being available, Mr. Taylor is inclined to believe the apple yield of Michigan falls a little below that of Missouri, New York and Illinois.

According to statistics, compiled by the Secretary of State, Michigan had, in 1898, about 196,541 acres in apple orchards. As no material change has taken place since '98, we will, for convenience, assume this to be the present apple acreage in the State. Of the number of acres in orchards above mentioned, 142,054 are in the southern four tiers of counties. These figures represent nearly three-fourths of the entire apple acreage of the State. Taking the counties of the State as a whole into consideration, Oakland is in the lead, with 9,096 acres of apple orchards. Allegan, Berrien, Kent, Van Buren, Lenawee and Washtenaw counties follow in the order named, with areas varying from 5,500 to about 7,000 acres. Among the northern counties of the Lower Peninsula, Grand Traverse has the largest area in orchards, some 2,277 acres in all. Next in order among the larger apple producing counties of that section come Leelanau, Mason, Antrim, Manistee, Charlevoix, Benzie and Osceola counties. In the Upper Peninsula plantings have been light, aggregating only 618 acres in all counties. Delta county has 195 acres, Menominee 98 and Marquette 73. These three counties have the largest acreage for that section. Prof. Taft considers prospects good for hardy apples in nearly all counties of the Upper Peninsula. He expects to make very extensive plantings at the new Experiment Station in Alger county next spring.

The general condition of Michigan apple orchards is well known. Nearly everywhere, especially in the lower counties, one meets with old neglected apple trees. Most of them are in sod and have suffered much from bad pruning or from entire lack of pruning. The tops have become a tangled mass of brush and dead wood, and the fruit produced is often scabby, wormy and almost worthless. With such conditions as these existing, a good many farmers have become discouraged with apple growing and have made stove wood of their trees. During the 11 years intervening between 1887 and 1898 there was a falling off of 15,162 acres of apple orchards in the State. This condition did not prevail in other lines of fruit growing. During the period just mentioned the acreage of peach orchards in the State very nearly quadrupled. This decrease in apple acreage has taken place mostly in the lower counties of the State, and in some instances has amounted to about one-third of the original acreage of the county. There has also been some falling off in a part of the central counties of the State, but when we come to the northwestern counties we find that to a certain extent there is a reverse of conditions. More new orchards have been planted in that section, and in some counties the area set to apple orchards has doubled during the 11 years mentioned. If present indications can be relied upon, this northwestern section will, in the course of a few years, become the largest apple producing district of Michigan.

While attending Farmers' Institutes in some fourteen central and lower counties of the State this winter, I endeavored to learn what tendency toward the planting of new orchards existed. Only in Oceana, Newago, Saginaw and Oakland counties did I learn of any noteworthy disposition to make new plantings. In the other counties visited there seemed to be some inclination toward giving the old orchards better care, but there was apparently little disposition to put out young trees to take the place of the old orchards rapidly going to pieces.

But taking the State as a whole, it seems evident from answers to inquiries made of nurserymen and others that there will be an increased planting this spring over that of a year ago. Greening Bros., well known Monroe county nurserymen, estimate the increase to be about 50 per cent. They report that quite a number of fruit growers whose peach trees were injured last winter are replanting a portion of their peach orchards with apples, setting the trees 36 to 40 feet apart, with peaches in between, the object being that in case of a freeze out, they will have the apple orchards left to fall back on. Nurserymen state that the greater part of their orders for next spring come from the northern counties.

But granting an increase of 50 per cent, it is doubtful whether the new plantings will prove sufficient to hold the acreage of the State up to its present limits. As before stated, nearly three-fourths of the apple orchard area of the State lies in the lower four tiers of counties, or in a section where the trees are oldest and have suffered most from neglect. Many of these old trees are annually being removed, and taking into consideration the extent of this orchard area, it will be seen that the rate of decrease must be somewhat rapid. But acreage of itself counts for but very little. I presume that if one-fourth of these old orchards of the State were at once removed, Michigan as an apple producing state would gain rather than lose, because there would be fewer insects, less trouble from diseases, and less inferior fruit to go upon the market in competition with a better grade from younger orchards.

Knowing the general condition of our apple orchards as they exist today, it is evident that from the standpoint of profit, one of two things should be done; either the old orchards should be improved or new ones planted to take their places. In cases where orchards are not in too bad condition, renovation is to be recommended. Some remarkably good results were obtained in the State this past season through improvement of old orchards. Orchards which through neglect had produced little if any good fruit in a number of years, were made by pruning, plowing and spraying to yield last fall good crops of smooth, sound fruit.

If new plantings are made, it will not pay to start in on the old line of hay and pasture orchards as soon as the trees commence to bear. Our old orchards would seem to be a warning against this method of handling, yet I have seen a few young orchards this winter which are receiving no better care than most of the old ones have received. More careful attention should be paid to pruning, both at the time the trees are set out and each year following. The importance of starting right is not always fully realized, although we often hear this point strongly emphasized. This winter I learned of young apple orchards being set in sod, and of trees being put out with no pruning, either of the roots or

tops. The men who did the planting were wondering why their trees did not do well. The trees should be headed moderately low and trained with reference to convenience in spraying, for spraying must be regarded as a regular orchard practice if one expects to succeed in apple growing in the future.

The orchard should be kept cultivated, for it is difficult to keep moisture enough in the soil to supply the demands of trees in sod carrying a load of fruit, and besides, the grass robs the trees of plant food needful for the growth of wood and production of fruit. Apple trees are strong feeders and require plenty of plant food, something which few of our old orchards have been supplied with beyond what was in the soil when the orchard was set, and a large part of that has too frequently been removed by other crops. In 1895 Prof. Roberts, agriculturist of Cornell University, began an investigation to determine the cause of apple failures in many orchards of New York State. It was suspected that soil exhaustion was the cause of the difficulty, since the unprofitable orchards had received little or no fertilizer. By careful research, and by the aid of the chemist, the supposition was found to be a correct one. Prof. Roberts furnishes as a result of his work, figures which show that an acre of apple orchard will in twenty years of bearing life, if fruitful, remove from the soil plant food to the value of about 87 dollars more than will an acre of wheat during the same length of time, assuming an average yield of 15 bushels of wheat per acre.

Harvesting demands greater care, both as to time of picking and method of handling the fruit. Some growers are at present using simply constructed burlap-covered tables in their orchards to sort and pack from just as the fruit is removed from the tree, rather than putting the apples in large piles on the ground to be exposed for some time to sun and rain. This method is usually found much more satisfactory than the old one, and is to be commended. Pack honestly and carefully is still the admonition of commission men when approached on the subject of packing, showing there is still some room for improvement along this line. Commission men are capable of giving some good advice on subjects pertaining to the marketing of fruit.

As to varieties, the Spy, Baldwin and Greening are still among the leading commercial sorts planted in Michigan, and there seems to be little indication of any radical change at present, although Ben Davis has won considerable popularity in some parts of the State, and is being more or less largely planted. It would seem, however, that in markets supplied with Michigan apples there would be a sufficient demand for a better class of fruit to warrant more attention to quality in selecting varieties to plant. In recent years apple growers have been looking for a variety to take the place of the Baldwin, which has been too largely planted and which is quite subject to the attack of the scab fungus and is apt to be damaged by brownish, leathery spots appearing underneath the skin. Among varieties which have been tested for some time, Sutton's Beauty seems best fitted to take the place, at least in part, of the old Baldwin. It is superior to Baldwin in quality, equal to it in appearance, and less subject to the attack of apple scab.

Under proper conditions smooth, sound apples of best quality can be grown in nearly all parts of Michigan, and for such fruit there will

undoubtedly be as good a market in the future as in the past. While we are apt to think there is over-production of apples when there is a full crop in the various apple producing states, commission men and dealers claim there has never been too much good fruit produced. It is true, however, that poor fruit has often been in over-abundance and a drug on the market. The Michigan apple grower is favored with a soil and climate capable of producing just such fruit as brings the highest prices in market, and it rests entirely with him as to whether or not he will make a success of the business in the future.

INSECTICIDES, FUNGICIDES AND SPRAYING.

PROF. L. R. TAFT, AGRICULTURAL COLLEGE.

Three conditions necessary for success in spraying are, (1) the use of proper materials; (2) at the right time, and (3) in a thorough manner.

In the selection of spraying materials one should have a knowledge of the nature of the insect or disease for which it is to be used. For nearly all plant diseases an effectual remedy will be found in sulphate of copper, commonly known as blue vitrol, either as a solution or combined with an equal weight of lime, in what is known as Bordeaux mixture. The latter has the advantage of remaining for a long time on the fruit or foliage, and it can be used much stronger than the solution, without danger of injuring the foliage. On the other hand, copper sulphate solutions are easier to prepare and apply, and when immediate effect only is desired, they are more effective and do not have to be as strong. The solution will be found most desirable for destroying spores and mycelium of fungi that may be upon the trees or plants, while the adhesiveness of Bordeaux mixture renders it especially valuable as a preventive against the attack of fungi.

Whichever material is used, complete success cannot be secured unless all parts of the plants are covered, and the applications must be repeated sufficiently often, during the period of the year when there is danger of attack, to secure this.

Nearly all fungi live inside their host plants, and when seated beneath the epidermis are beyond the reach of fungicides, and hence the remedies must be used to serve as preventives to keep them from entering. The portions that suffer most are the growing parts of the stems, the leaves and the fruits, but as many fungi winter on the bark or buds of the old wood, it is always desirable to give the fruit t an application of copper sulphate solution in the spring, before the buds open. At that time it can be used as strong as one pound in fifteen gallons of water without danger of injury to deciduous trees. For leaf-curl of the peach a single application will prevent all injury, but it must be made about four weeks before the buds open. Later applications are of some value, but serious loss may result, in the case of varieties subject to attack, if the spraying is delayed after the middle of April in average seasons at this latitude. While the small expense

of this early application will generally be repaid, with other fruits the use of Bordeaux mixture just before the flower buds open will be even more effective. The principal objection to putting off the first application until this time is that rains may occur during the two or three days when the remedy will be most effectual, and when one has large orchards the period during which spraying will be most effectual is not sufficiently long to permit the work to be done. The best results will be secured when the early application of copper sulphate solution is made, and this is followed by the use of Bordeaux mixture upon as many trees as can be sprayed after the flower buds form, but before they open. For powdery mildew the use of a solution of liver of sulphur at the rate of one ounce in three gallons of water will be even more effectual than Bordeaux mixture.

The number of applications that will be needed of any fungicide will depend largely upon the season, but at least two should usually be given after the trees blossom, and three or four will often be desirable.

For the destruction of insect pests there are two classes of remedies upon which the principal reliance should be placed. One of these contains the arsenites and other materials that will destroy insects on being taken into their stomachs. These remedies can only be used against biting and chewing insects, but for all of this class that feed upon the exterior portions of plants they are ordinarily the best that can be selected.

There are, however, a large number of sucking insects, such as plant lice and the various scales, for which these remedies cannot be used, and recourse must be had to such as will kill them by contact or act through their breathing organs.

Paris green is the most commonly used arsenite, and in an unadulterated form contains about 50 per cent of arsenic. It sometimes troubles by quickly settling in the water and by burning tender foliage. London purple contains slightly less arsenic, united with lime, and is more likely to burn the foliage, but will remain suspended in the water for a longer time. These arsenites are used in water at the rate of one pound in from 100 to 200 gallons, but when the stronger preparation is used, especially if upon plants with tender foliage, it is desirable to use two pounds of lime to each 100 gallons, unless the arsenite is to be added to Bordeaux mixture. For ordinary spraying purposes it is always well to combine an arsenite with Bordeaux mixture, as both are generally needed, and, if applied at one time, it will be to the benefit of both, besides the saving of labor.

White arsenic has recently come into use as a substitute for paris green. Its cost per pound, wholesale, is less than one-half that of paris green, and but little more than one-half as much need be used to secure the same results, so that the actual cost of white arsenic as an insecticide is but about one-fourth that of paris green. To be used with safety upon plants it must be dissolved and then rendered insoluble by combining it with lime. This can be done by boiling one pound of arsenic with two pounds of freshly slaked lime in two gallons of water for forty minutes. The arsenite of lime thus formed can be added to Bordeaux mixture, one pound of arsenic, prepared as above described, being sufficient for 150 gallons for use upon potato beetles, or

for from 200 to 400 gallons for fruit trees. If used in water it will be best to use one or two pounds of lime for each barrel.

Among the contact insecticides, kerosene is the cheapest and most effectual. It can be used as an emulsion, with either hard or soft soap, at the rate of one gallon in 15 gallons of water, upon nearly all plants during the summer. At this strength it will be effectual against most plant lice. When used against scale insects at this time, the strength should be doubled. During the winter and early spring, before growth starts, one gallon of kerosene may be used with three or four gallons of emulsion, and this strength is desirable against many scale insects.

During the last few years special pumps have been invented for the making of chemical emulsions of both crude and refined kerosene. The proportions can be the same as those given above, but care should be taken to use a fine spray, and, when the stronger emulsions are used, a warm, bright day in spring should be selected.

When trees are to be sprayed, a pump with brass working parts should be used, and this should be mounted on a barrel or tank, the latter being always desirable where large orchards are to be treated. For tall trees there should be extension rods of brass or bamboo, at the end of which a nozzle that will throw a mist-like spray should be placed. A good pump will carry two lines of hose, with double or triple nozzles at the end of each, and with such an outfit an orchard can be quickly, cheaply and effectually sprayed.

WEDNESDAY EVENING.

DR. FREER'S LECTURE ROOM AT 7 O'CLOCK.

LIQUID AIR.

PAUL C. FREER, PH. D., M. D.

An abstract can give no fitting idea of this beautiful and interesting lecture, nor could a report of the lecture in full do justice to its presentation unless accompanied by full illustrations of the apparatus used and the experiments performed. The liquid air machine exhibited is the only one between New York and San Francisco. For a full hour Dr. Freer held the audience spellbound, as well by his personality and beauty of diction as by his unique experiments with liquid air. These experiments were to the entire audience a revelation. No person attending the Institute will ever forget these experiments, made possible through the kindness of Dr. Freer.

WEDNESDAY EVENING.

UNIVERSITY HALL AT 8 O'CLOCK.

President J. L. Snyder, Agricultural College, in the Chair.

IMPORTANCE OF CO-OPERATION IN EDUCATION.

ROBT. M. WENLEY, SC. D., D. PHIL.

Prof. Wenley made a brief address on "The Importance of Co-operation in Education." Having worked the audience into a happy vein by two apposite and excellently told stories, he went on to say that today farmers must be to some extent scientific men. To get the necessary knowledge they have no resource but to co-operate. As two heads are better than one, so are two pocketbooks. Instructors, lecturers and the like cannot be secured without co-operation. The township school is better than the district school, because more organize for its up-keep. This organization is specially incumbent upon those who, like the farmer, live in sparsely inhabited tracts of the country. Further, imitation is a strong trait in man; like the rest, the farmer takes home a hint from his neighbor and applies it. He has peculiar advantages, too, in the ease with which he can co-operate. He needs no laboratory, he needs no elaborate apparatus. His farm is his laboratory, he experiments with his implements in the daily round of work. There he observes, learns, adds here or there a new fact to the store he has been accumulating for years.

It is often said that the farmer is slow and conservative, and a large part of the ballast of the ship of state. That he is conservative is true; but the reasons usually given for his conservatism are beside the mark. It is the nature of his occupation that causes this habit of mind. In the quiet of the fields, disturbed by nothing but the clank of the harness, the chirp of birds, or the rush of the wind through the trees, the farmer becomes reflective, is enabled to go on without distraction in his chains of reasoning. He puts things together and thus arrives at safe conclusions. This makes him conservative. He works out theories, indeed, but theories proceeding from his own practical life. Now this life offers him peculiar facilities for making his own endowments as a human being co-operate. The average man is capable of two main things—understanding and expression. We usually educate to develop the former. But the farmer has wonderful chances of emphasizing the side of expression. In thus educating expression by the work of his hands, he is actually working out co-operation, and is helping himself to become a better all-round citizen—better than the poor professor, who is cooped up within four walls with an abundance of bad air. Thus farmers gather ideas from their own experience, and are enabled, each one in his own individual way, to contribute to the science of agriculture which, in turn, furnishes new ideas to all.

It has been said that a feminine toilet table is an altar raised by vanity to self-love. This Institute is something far more important—it is an altar raised by co-operation to self-development. Your co-operation in it is for your betterment, and not only this, but for the advancement of us, your fellow citizens in this great commonwealth of Michigan.

THE TREND OF AGRICULTURAL EDUCATION.

L. H. BAILEY, PROFESSOR OF HORTICULTURE, CORNELL UNIVERSITY.

The speaker outlined the present day movements in education, explaining the meaning of the extension idea, and specifying ways in which the higher education is taken directly to the people. Originally, education was aristocratic. It was the privilege of the few. Universities were established before common schools. It is only within the last century that it has become an axiom that everyone should be educated. The general trend of education, therefore, is from the top downwards. In the course of his remarks the speaker gave an outline of the history of agricultural education, some of the leading points of which are specified below:

The first distinct advance in the actual teaching of common-life subjects to common people, seems to have been that of the great Francke, 1663 to 1727, at Halle, Saxony. He was the center of the Pietist movement, which sought to impress the spiritual aspect of religion into teaching. He was deeply interested in the poor and the orphans, and established schools for them. To these pupils, aside from the regular subjects, "there should be taught out of school hours, and particularly in excursions or walks," according to Rein, all kinds of useful knowledge, "as it were by play."

With this came the beginnings of manual training, since the orphans during their leisure hours were required to grind with the hand mill, to work in the house, kitchen and garden, to sew, knit, card wool and spin. The plan of studies of these schools was first published in 1697. The educational and philanthropic enterprises set on foot by Francke are still in existence at Halle.

The ideas of Francke spread and prospered; and many fearless innovators espoused them. Into this awakening consciousness came Ferdinand Kindermann, "father of industrial education." He was a Bohemian. His teaching attracted the attention of Maria Theresa, who, towards the close of her reign, inaugurated, in the language of S. G. Williams, "a work for schools such as no crowned head had ever dreamed of." Her educational reforms were in the hands of Von Felbiger. The purpose was to popularize education. Kindermann had introduced hand work into his parish schools in 1771.

Even before Kindermann had established his technical school training, distinct progress had been made in the undertaking of agricultural education. These early attempts were necessarily supported by individuals, societies or religious bodies, for the era of state aid for general

education had not yet arrived. Thomas P. Gill writes as follows of the early movement in France: "The National Society of Agriculture of France, in 1761, urged the appointment of agricultural professors, and charged several of its own members with a propagandist mission to arouse and enlighten agricultural opinion. Some great proprietors were inspired by this means to found schools of agriculture in different places. One was established at La Rochette in 1763, another near Compiègne in 1771, and agricultural instruction was given at the Seminary of Angouleme. Louis XVI, in 1787, created an experimental sheep farm at Rambouillet, where he introduced flocks of Spanish Merino sheep, which soon greatly enhanced the prosperity of the farmers of LaBrie, Beauce, Burgundy, Champagne and Picardy. At the time of the Convention the bases of the great system of technical education of France were laid down, but nothing was done for agriculture. In 1800, Francois de Neufchateau, a former minister of the interior, who had the distinction of foreseeing at that date the danger to European agriculture of American competition, laid before Bonaparte an elaborate scheme for agricultural education, which he had copied from the Abbe Rozier, who had propounded it in 1770, but, though the First Consul in the main approved, the scheme was never carried out. In 1819 a private individual, Matthieu de Dombasle, established, with funds which he had raised by public subscription, an agricultural school near Nancy. This school became very famous, and was frequented by pupils from Germany, Austria, Switzerland and other parts of the continent; but when Dombasle died it had to succumb, as it was receiving no assistance from the state. It left, however, its traces, for in 1829 the School of Grignon, near Versailles, which has since been taken up by the state and made one of the great national schools of agriculture, and in 1833 the school of Grandjouan, and in 1840 of Saulsaie, which have also since become state schools, were founded by pupils of Matthieu de Dombasle." The first regular system of agricultural education supported by the state in France was inaugurated by the law of 1848.

Mulhall says that "it is hardly too much to say that Hungary has done more than any other nation in the way of agricultural schools. The first was established in 1779, at Zarvas, by a patriotic gentleman named Samuel Teschedik; the second in 1786, by Cristof Nako, at Nagy-Miklos; the third was the famous Georgicon Academy at Kezthely, founded and liberally endowed by Count Festetics, in 1797. This last was for a long period the model agricultural college of Europe, but after a prosperous career of fifty years it was suppressed by the Austrian government in 1848, because all the professors and pupils took part in the struggle for independence under Kossuth." In Bohemia an agricultural school was opened in the village of Tirnova in 1791. The present system of instruction in Austria dates from 1850.

The agricultural college of Hohenheim, Wurtemburg, perhaps the most famous in the world, was founded in 1818. It has a large model farm. The course is three years. Its attendance is about 100 students. German speaking peoples have done much for agricultural education. "It was about one hundred years ago," writes C. K. Adams, in 1886, "that Frederick the Great conceived the idea of improving the resources of his kingdom by the establishment of agricultural schools and the reclaiming and improving of waste lands. Everybody knows that the absorbing ambition of that great monarch was to make Prussia one of

the foremost powers of Europe. He had the sagacity to perceive that this could only be done by developing in every practicable way the natural resources of the realm. Accordingly, though his kingdom was small and poor, he set apart as much as thirty-two million dollars a year for the purpose of improving its agricultural condition. His successors followed his example, and the development of agricultural instruction has steadily progressed down to the present day. Just after the battle of Jena, for example, when Prussia had been reduced to about one-half its former territory and population, the famous school at Moeglin was founded and put under the direction of the celebrated savants Thaer and Wolff. After the revolution of 1848 the department of agriculture was raised to the dignity of a separate ministry, and from that time to the present the policy of the government has led to the constant enlargement of existing schools and to the frequent establishment of new ones. The example of Prussia was followed by other states. The far-famed academy of Tharandt was founded in 1811, in the midst of the turmoil incident to the Napoleonic wars. In a similar manner, after the battle of Sadowa, the same government, that of Saxony, established the agricultural college of the University of Leipsic.

It would be difficult to determine the date of the first organized effort to found a school of agriculture in North America. As early as 1794, a definite educational scheme was outlined by a committee of the Philadelphia Society for Promoting Agricultlre. At a meeting of this society on January 21 of that year, it was

"*Agreed*, That Mr. Bordley, Mr. Clymer, Mr. Peters and Mr. Pickering be a Committee to prepare Outlines of a Plan for establishing a State Society for the *Promotion of Agriculture;* connecting with it the *Education of Youth* in the Knowledge of that most important Art, while they are acquiring other useful *knowledge suitable for the agricutural Citizens of the State:*

"And a Petition to the Legislature, with a view to obtaining an act of incorporation."

A week later "the outlines of a plan" was presented to the society, it having been brought into the committee by Mr. Peters. The Legislature was to be asked to incorporate the proposed society. Details of membership and organization were included in the report or application. Agricultural information was to be disseminated in whatever manner the legislature should think best, "whether by endowing professorships, to be annexed to the University of Pennsylvania and the College of Carlisle and other seminaries of learning, for the purpose of teaching the chemical, philosophical and elementary parts of the theory of agriculture; or by adding to the funds of the society, increase their ability to propagate a knowledge of the subject, and stimulate, by premiums and other incentives, the exertions of the agricultural citizens; or whether by a combination of these means the welfare of the state may be more effectually promoted." County societies were to be created, with "county schoolmasters" as secretaries; "and the school houses the places of meeting and the repositories of their transactions, models, etc. The legislature may enjoin on these schoolmasters the combination of the subject of agriculture with the other parts of education. This may be easily effected by introducing as school books those on this subject, and thereby making it familiar to their pupils." "When the funds of the society increase sufficiently to embrace the object, it will perfect all

its efforts by establishing *pattern farms* in different and convenient parts of the state." The recital of the things which might be done on these pattern farms would do credit to many an experiment station of the present day. "When the pecuniary affairs of the society become adequate, it will highly contribute to the interest of agriculture if, at the expense of the society, some ingenious person or persons were sent to Europe for the purpose of agricultural inquiries. It would be well, too, if a few young persons, of promising abilities, were sent thither, to be instructed in the arts of husbandry, the breeding of cattle, etc., and to gain a practical knowledge on all subjects connected with this interesting, delightful and important business, on which the existence, wealth and permanent prosperity of our country so much depend." This report made to the society is most entertaining and wise. Its fate is recorded in a single laconic sentence by Bordley: "The application was rejected; by *husbandmen* who were principally to be benefited."

Farmers' College, at College Hill, Ohio, six miles from Cincinnati, seems to have been the first American agricultural institution of learning to attract wide attention. The institution started as a private literary academy in 1833. Mr. F. G. Cary, its founder, taking four pupils into his own family. "The enterprise meeting with favor," runs an account published by the institution in 1853, "a small detached building was erected, and with the increased demand for additional accommodations, other, and more commodious, were from year to year provided. The first academic year closed with twenty-eight pupils; the second with forty; the third with fifty-eight; and so on, steadily increasing every year during the existence of the academy. For several years the catalogue exhibited an average of more than one hundred pupils; many of them well advanced in the classics and higher mathematics." It was known as Pleasant Hill Academy.

In the winter of 1846-7, the institution was enlarged and reorganized under the name of "Farmers' College." The institution was not designed at this time to be a technical agricultural college, but to offer a general training with particular application to practical affairs. The catalogue announces the following faculty:

F. G. Cary, A. M., President, and Professor of Moral Philosophy and Rhetoric, and Superintendent of Buildings, Grounds and Finance.

R. H. Bishop, D. D., Professor of History and Political Economy.

J. W. Scott, D. D., Professor of Chemistry and its Application to Agriculture.

John Silsby, A. M., Professor of Mathematics, Natural Philosophy and Astronomy.

J. G. Wilson, A. B., Instructor in the Ancient and Modern Languages.

G. S. Ormsby, Teacher of Preparatory Course.

"It will be seen by an examination of the above course," says the announcement in the second annual catalogue, 1848, "that, in its parts and as a whole, it is highly practical; and that it is arranged to meet the wants of a large class of young men who wish to become teachers, or efficient business men, who have not the time, money or inclination to take the long classical course which is made requisite to secure the honors of any of the regular colleges." A three years' course was given in the college proper."

A second reorganization was begun in 1852, for the purpose of providing "the means of educating in practical agriculture and horticulture,

such students as may desire such course of instruction, or whose parents or guardians may direct such course for them." It was proposed to equip a farm for instruction and experiment.

For several years, under the leadership of Cary, the agricultural department appears to have thrived, but in the sixties the interest seems to have begun to wane. The sessions of the college were suspended from 1870 to 1873, "on account of the discouraging effects of the civil war." Resuming, in the catalogue of 1873-4, the name of John A. Warder, known of every horticulturalist, appears as "Cary Professor of Theoretical and Practical Agriculture," and the following announcement is made of his incumbency: "In the catalogue of 1873-4, the 'Cary Professorship' is announced. For this department the board have been able to secure the services of Dr. John A. Warder. Dr. Warder's devotion to this department, in all its various divisions, embracing the production and culture of field, forest, garden and lawn, including pomology, and our varied flora as well, is so generally known that no word of commendation from us is needed to designate him as the right man in the right place. To the rich stores of knowledge he has acquired at home by years of study, travel and experience, he now adds the results of his observations and study in Europe, on his recent tour in the service of the government of the United States as Commissioner to the World's Exposition at Vienna."

In 1884, Farmers' College became Belmont College. On the 31st of December, 1889, the Ohio Military Institute was chartered, and on the following September this institution was opened in the old site at College Hill. This institute still exists, and thus has passed away the first great effort, in North America, to teach agriculture.

Mentor and Nestor of this enterprise was Freeman Grant Cary. Pioneer in agricultural education in this institution of the young and growing West, his name is yet not preserved in the biographical annals of our country. Often the greatest and the best of men escape the historian. The very unselfishness of their lives is the reason for their oblivion. The historian has a prescribed horizon. There are some fields which he does not care to see. Agriculture is one of these, but it does not follow therefrom that the field is void of interest. Cary's name will live. The man came of a long New England ancestry. He was cousin of the Cary sisters, Alice and Phoebe, whose Clovernook songs are pictures of the home near Cincinnati. I am indebted to General Samuel F. Cary, brother of our preceptor and himself long identified with the Farmers' College, for the following sketch: "Freeman G. Cary was born in Cincinnati, April 7, 1810. He came of Puritan stock, his ancestor, John Cary, being one of the founders of the Plymouth Colony. When he was four years old, his parents moved to the village of College Hill, then a wilderness. He graduated at Miami University, Oxford, Ohio, in the class of 1831. He started a classical school, Cary's Academy, in 1833. He was a popular instructor, and a large number of young men sought admission to the school, and he soon had more applicants than he could accommodate. The farmers in the surrounding country held a meeting and agreed to erect suitable buildings and let Mr. Cary have the use of them. They obtained a charter from the state legislature, and gave the institution the name of Farmers' College, from the course of instruction and the fact that the greater number of its patrons were farmers. A tract of land was purchased and labora-

tories were erected for the analysis of soils and fertilizers, and practical demonstrations were given in raising different varieties of trees, shrubs, fruits and vegetables, in budding and grafting. My brother resigned the presidency of the college to take charge of the agricultural department, which was not continued many years for want of funds. The institution was founded on the scholarship plan, which proved not to be successful nor practicable. In the height of its prosperity, there were more than three hundred pupils in attendance. It flourished until the time of the civil war, when its numbers were diminished, and it never regained its old footing. The directors thought, as the character of the institution had changed, a change in name might be beneficial, and for a time it was called Belmont College, and finally merged into the Ohio Military Institute. My brother severed his connection with the institution in the fifties, and moved to a farm near Hamilton, Ohio, where he had an opportunity to gratify his taste for agricultural pursuits. He was an enthusiast in his line. He died at the age of 79, in 1888, of heart failure, never having had a day's illness." No more fitting sentiment can be associated with Cary's name than the following sentence, which he wrote in "Cincinnatus," in 1857, when speaking of the newly founded Agricultural College of Michigan: "We trust it is the mission of American institutions to enlarge the platform of a university education until it shall embrace the liberal education of men for every honorable calling and pursuit, and let it be our zealous endeavor unitedly to labor to effect so desirable a consummation."

The "Ohio Agricultural College" was opened in Oberlin, Northern Ohio, in 1854. It ran one year at Oberlin and two years at Cleveland. The largest attendance was about forty students. It did not grow, and therefore was discontinued. Dr. Townshend, one of the lecturers, then went to Columbus and urged the State Board of Agriculture to endeavor to secure aid from the legislature. It was suggested that $3,000 be asked. The board did nothing, and the matter was dropped. Professor George T. Fairchild, writing of it in 1897, speaks as follows of this venture: "A course of winter lectures for farmers was organized about fifty years ago in Cleveland, Ohio, under the leadership of the lamented Dr. Norton S. Townshend, late professor of agriculture in the Ohio State University. Some of the best educators in the region were associated in the work. An elder brother of mine, then and since connected with Oberlin College, carried the literary part of the work, with the earnest hope of opening to farmers of the Western Reserve the treasures of pleasure and of power in the world's best thoughts. This lecture course failed for lack of patronage, as well as lack of endowment, just as other good enterprises have failed."

THE GOVERNMENT COLLEGES.

We now come into the period of the founding of the great agricultural colleges. The reaction from the old academic and classical education had awakened a widespread sentiment for popular education. In many of the older states this movement had acquired great power, and the leading fields in which this new education was to be applied were agriculture and the mechanic arts. As early as 1826, Lieutenant Governor Talmadge recommended that greater attention be paid to the general teaching of "the sciences connected with agriculture and the

mechanic arts" in New York state. In 1836, the legislature of New York granted a charter for an agricultural college. It was proposed to buy a farm and to establish a school on it. In other states similar movements were on foot. The agitation became personified in Justin S. Morrill, representative and later senator from Vermont, and it culminated in the college land grant act of 1862, which, as Hewett says, is "the noblest grant for popular education which the world has known."

Of the agricultural colleges which were opened before the passage of the Morrill bill, only the Michigan institution has lived, and it has been fitly called, for America, "the mother of agricultural colleges." It was opened to students in May, 1857. It was the first agricultural institution in this country, so far as I know, to be maintained wholly by the State. Cary commented pleasantly upon the opening of this institution in The Cincinnatus for August, 1857. He closed his review by saying that "the directors of Michigan Agricultural College have marked out a course of mental training as extensive for the scientific agriculturist as for the man of letters, and on its completion give equal honors. And we trust it is the mission of American institutions to enlarge the platform of a university education, until it shall embrace the liberal education of men for every honorable calling and pursuit, and let it be our zealous endeavor unitedly to labor to effect so desirable a consummation."

Despite the early agitation in New York, an agricultural college was not opened until 1860, and because of the war it existed less than half a year. The professor of agricultural chemistry and botany was William H. Brewer, now known for his long and efficient connection with Yale. The site of the New York college is now occupied by the Willard State Insane Asylum.

In 1864 began the negotiations between Ezra Cornell and the state, which ended in the establishment of the Cornell University, an institution which in time was destined to solve the question of agricultural and technical education of true university rank.

Another type of movement towards agricultural education originated in the desire to popularize and apply agricultural chemistry. In this field Yale College has always been a leading spirit. A course of popular lectures on agriculture was also given at Yale in the winter of 1859-60, and abstracts of them were published in book form in 1860, by Henry S. Olcott, under the title, "Outlines of the First Course of Yale Agricultural Lectures." These excellent lectures ran through four weeks, and they were given by specialists from various parts of the country. The first week was devoted to agricultural chemistry, the second to pomology, the third to "agriculture paper," the fourth to domestic animals.

The ideas which were paramount in the early days of agricultural education are well reflected in the courses of study, and a comparison of the old course with those in vogue at the present day will show what the evolution has been. The course offered by the Agricultural College of Michigan in 1861 was as follows:

FIRST YEAR.

Geometry.
Meteorology.
History.
Trigonometry and surveying.
Elementary chemistry.
English literature; bookkeeping.

SECOND YEAR.

Physics.
Vegetable physiology and horticulture.
Rhetoric.
Civil engineering.
Botany, horticulture and mineralogy.
Inductive logic.

THIRD YEAR.

Drawing and rural engineering.
Geology.
Mental philosophy.
Astronomy.
Zoology.
Moral philosophy.

FOURTH YEAR.

Analytical chemistry.
Animal physiology.
Political economy.
Agricultural chemistry.
Entomology, veterinary medicine, economy of domestic animals.
Technology, household and rural economy.

It is interesting to note the conflict of opinions which has always obtained respecting compulsory manual labor at the agricultural colleges. One idea, typified in the Michigan Agricultural College, compels manual labor for the double purpose of enforcing the dignity of labor and of teaching the practical operations of the farm. The opposite idea, typified in Yale and Cornell, considers that manual labor, as such, can be better taught on a farm than at a college or university. It holds that the dignity of labor is upheld by the man's thinking rather than by his mere doing. The compulsory labor system is now extinct in most institutions, even in Michigan, and in its place is labor which is educative and illustrative. Compulsory labor has given place to laboratory labor.

The whole controversy over compulsory labor has really turned on the confounding of training with education. As the colleges rose in grade and efficiency, true education came more and more to be emphasized, and apprenticeship and training came more and more to be neglected. There were some institutions which discarded the manual training idea even from the first. Farmers' College was one of these.

For the agricultural colleges, the battle over compulsory student labor is now fought to a finish, and the victory is with the opponents

of the system; but it is none the less true that in institutions of lesser grades—that is, in training schools—a compulsory labor system may be advisable and necessary.

Another battle royal has been fought between the agricultural college and the university. It is not surprising, seeing that industrial education is a revolt from the older literary education, that there should be a schism between the two. Each was intolerant of the other. The agricultural college suffered in the competition, when placed alongside the literary institution. This was proof of its weakness. I well remember in my student days at the Michigan Agricultural College, that it was the general opinion that an agricultural institution must of necessity be separate, and that all agricultural departments connected with universities were doomed to failure. The real difficulty, however, lies in the unlike spheres or standards of the two, not in the fact that the one taught agriculture and the other taught Greek. Too often the idea of the agricultural college was that of a training school, or at highest the grade of an academy, whereas the university idea is distinctly that of the highest education. As soon as the agricultural college does real university work it amalgamates perfectly with the university, as is clearly shown by the experience at Cornell.

CONCLUDING REFLECTIONS.

Two centuries and more have passed since definite attempts were first made to instruct the common people in the principles and practice of their trades, and yet the common people are still untaught in those subjects. It is easy to found and maintain institutions for the higher education; it is difficult to reach the masses. Nearly every effort which has been designed to afford simple technical education for the masses has resulted in affording higher education for the few. One reason for this is the fact that these efforts presuppose thoroughly equipped permanent institutions, or buildings and apparatus; these things cannot be moved, and therefore the people must come to the institution or be uncared for. These institutions have been of incalculable benefit, and they should be maintained and strengthened; but what we most need now in agricultural education is a movement, not more institutions. When movements become institutions, they cease to be movements; they are stationary! We need movements which move. Christ did not found a church; he taught.

I mean that we need some effort which has so little luggage that it can go to the farmer's home. I do not believe that an effort should be made to give every man a liberal education; I am not sure that everyone should go as far as the high school; but every man should be awakened and interested to some degree to know and appreciate the things with which he deals. Strange that education should have begun with the universe and end with the daisy!

The university extension movement is the greatest educational fact of this generation. At last education seems to have broken its bondage of creeds and to have become a missionary. Of this extension movement, the greatest application to agriculture has come in the last two years in the nature-study enterprise. It is vital and fundamental for the reason that it interests the farmer in the things with which he lives.

It is apparent that there is a growing feeling among educators that

the agricultural colleges cannot directly reach the masses. The masses have known this for a long time. The educators either have not known it or have not admitted it. To admit it would seem to admit a weakness, and the agricultural colleges were not sufficiently entrenched in popular estimation to make such admission safe. But it is not an evidence of weakness, but of strength. The colleges can do the best work for higher education when they are somewhat removed from the masses. We should supplement them by primary and secondary education. Nature-study may be expected, if properly carried out, to supply the primary education. Agricultural high schools, and agriculture in high schools, should supply the secondary. Of agricultural high schools we have little experience in this country. The successful effort in Minnesota is our best example.

I close my remarks as I began, by saying that the only fundamental help for farming is to make better farmers, and we make better farmers by making better and wiser men. Wiser men will not only surmount their individual and local difficulties, but they will make themselves felt in removing the transient political and economic ills which are amenable to legislation. There are always some among us who believe that political ills are responsible for most of the unfortunate predicaments of agriculture. Apostle of this faith was John Taylor, of Caroline county, Virginia, who wrote the famous "Arator" early in this century, lampooning Alexander Hamilton with the right hand and discoursing on practical agriculture with the left. The tariff is with us, as it was with Taylor; but it is not ordained of nature to be always present. And if it is an ill, and therefore to be overthrown, it must be destroyed by the onslaughts of educated men, and an awakened agricultural sentiment. Permanent evolution comes slowly. All the old agitation for agricultural education was not fruitless; it set ideas in motion. Most of the early movements were through societies. Finally the time came when the State must foster education as a matter of self-preservation. Three great educational principles have grown out of the agitations of all these centuries. Remember them: the common people should be educated; the State should support education; education should have some relation to the daily vocation and living.

THURSDAY MORNING.

NEWBERRY HALL.

Hon. L. D. Watkins in the Chair.

TOPIC—LIVE STOCK.

Owing to the severe snow storm Wednesday afternoon and evening, and continuing through this afternoon, the street car ride to Ypsilanti had to be temporarily abandoned. For this reason the program for Friday was begun, taking up the papers the authors of which were present.

QUESTION BOX.

Q. Will crimson clover do well sown in the early spring?

J. D. Towar: Yes, but we look for best results sown in July or even in August, with the expectation that the clover will winter and be plowed under or otherwise used the following spring.

J. N. Stearns: Yes; I have had good success sown in the spring and plowed under in August.

Q. Will the legumes as catch crops preserve the nitrates as well as the non-leguminous plants?

J. D. Towar: Experiments show that the cereals have perhaps a greater power than the legumes to prevent the loss of nitrate during the late fall and winter. Any comparative defect in this direction is more than counterbalanced by the power possessed by the legume and not by the cereals to utilize the free nitrogen of the air.

Q. What is the best fertilizer for a marsh under cultivation, and how much should be used per acre?

J. D. Towar: Barnyard manure is incomparably the best fertilizer for undigested muck. Ashes come next, applied at the rate of a ton to the acre, if possible.

Q. How deep do you work your wheat ground with cultivator or harrow before sowing?

A. M. Brown: I plow six inches, and run the spring tooth harrow fully four inches deep, using plenty of power. This is on land that bore heavy timber.

Q. How did clover succeed when sown with peas in 1898-9?

E. A. Croman: Fairly well in 1898, but owing to the drouth in 1899 it did not do so well.

Q. Has the effort of the State, by vaccination, prevented anthrax or black quarter?

C. D. Smith: I know of no experiments in this State on that point, nor do I know of cases of these diseases inside its borders.

Q. Has there been any investigation at the College for the prevention of worms which destroy the clover roots?

C. D. Smith: There has not. I know of no way to prevent except to stop growing clover for a couple of seasons.

Q. Would oats sown in August or early part of September be of any benefit as a cover crop?

C. D. Smith: Yes, while the winter would kill the oats it would still act as a mulch on the soil and be of no inconsiderable benefit to the fertility of the orchard or other ground upon which the method was tried.

Q. How would it do to sow peas or oats and peas after corn, and follow with clover only, sown in August?

J. D. Towar: I have never seen it tried. Where the winters almost universally provide an abundance of snow the method might work. Otherwise, I should hesitate about recommending it.

Q. Will any variety of Soy Bean mature seed in this climate?

J. D. Towar: Early White, Medium Green and the Dwarf Soy Beans will mature seed in this climate.

Q. What are the best mixed grasses and clovers for meadows?

C. D. Smith: I have found no grasses equal to timothy and orchard grass for hay. Among the clovers I should choose ordinary red, mammoth, and alsike.

L. D. Watkins: I heartily recommend alsike and timothy.

Wm. Campbell: I have found orchard grass excellent in pasture, as it starts earlier than other grasses and comes up very quickly.

E. L. Lockwood: I have sown alsike for a great many years. I like it because it stays in the ground, makes excellent hay and is much hardier than other clover.

Mr. Bullock of Elba: I have sown medium clover in the corn field and secured a good catch.

L. D. Watkins: I would sow two pounds of alsike with six or eight of the medium red.

UP-TO-DATE CARE OF THE DAIRY COW.

J. W. HUTCHINS, HANOVER, MICH.

The dairy cow is an animal with a special function—that of milk production—and a special development for that work. The feed, which in the beef animal is used to maintain a high degree of animal heat and to cover the body with a coat of flesh, in the specially developed dairy breeds goes largely to the production of milk. Hence the need for special care for the dairy cow.

What is included in "care?" In one word—comfort. This includes many points. Let us specify some of them.

The dairy cow should be protected in severe weather. A most convenient method during the summer and early fall months is to provide a well littered shed or covered yard, sufficiently large to accommodate the cows kept. Here they may be protected from cold rains and from the chill of the frosty nights of early fall. By closing and darkening these sheds they make an excellent place for the cows to escape from the annoyance of flies and the intense heat of the day in midsummer. Here, too, they may be turned for exercise in the winter. The stables used in winter need not be expensive, but they should be comfortable. A stable in which the droppings freeze every cold night is too cold for comfort or for profit. The extra food used to maintain animal heat is a loss.

But in attempting to keep the cow comfortable, care must be taken that she be not deprived of pure air. Ventilate the stable in such a way that the cold air will not strike the cow directly; but by all means ventilate.

Another requirement is clean water at a temperature at which the cow will drink freely. When no device for watering in the stable is used, a cistern or shallow well, from which the water is pumped directly for the cow, is very satisfactory. When large tanks are used, some means of warming the water must be employed.

The food consumed is the material from which the cow must manufacture the milk product. It must be sufficient in quantity or production decreases; right in quality, or food is wasted. A certain amount is required to sustain the life, keep up animal heat and maintain the body at its normal weight. The product of milk, and hence the profit,

comes from what is consumed beyond this maintenance ration. Plainly there can be no profit without liberal feeding.

The most perfect ration is that found in the pasture of mixed grasses and clovers when at its best. As it deteriorates from over-ripeness or on account of dry weather, it should be supplemented with soiling crops, such as oats and peas, sweet corn and a grain ration. Most farmers desire to grow their own feed as far as possible, and this is practicable by retaining the bran of the wheat crop to balance the corn and other fattening foods. Early cut clover hay and well-cured corn fodder are among the best milk producing foods, and a grain ration of equal parts of corn, oats and bran will be found safe and highly satisfactory.

Some succulent food should be supplied in the winter. For this purpose some roots should be grown. The yellow tankard mangold may be quite cheaply grown and is highly relished by the cows.

These suggestions are for those farmers who, like the speaker, have too few cows, or for other reasons do not use the silo for preserving the corn crop.

The dairy cow is an animal with sensitive nerves and is strongly influenced by surrounding conditions and by the manner in which she is treated. One can hardly overestimate the value of kindness to her. Gentleness in the cow is a most desirable quality and is acknowledged to be largely the result of kind treatment. Many experiments go to prove that kindness has a marked effect on both the quantity and the quality of the product. Kind treatment and protection from worry from any source will pay.

Cows must be kept on every farm. An intelligent study of their needs and the application of the same business sense that brings success in other lines will make them a source of profit and gratification to their owner.

DISCUSSION.

Q. Do you feed your cows in the morning and clean the stables before milking?

Mr. Hutchins: Yes, sir.

Mr. Pinckney: We have been advised not to clean the stables before milking because by so doing we fill the air with odors detrimental to the quality of the milk. I am anxious to know the truth of this matter. I am inclined to think that the plan is not a good one. As to housing cows, I believe it is better to let them out for exercise than to keep them housed all the time.

A. M. Welch, Ionia: I heartily agree with the gentleman who read the paper that it is bad practice to turn cows out on cold days to water. If I should turn my cows out on such days I would suffer a loss of twenty-five quarts of milk in the yield of the herd. Cows should have access to water at all times if possible because we do not know just when they want water.

A Farmer: When I go to the stable in the morning I milk first, being very careful not to stir up the droppings before milking. After milking I feed silage, then go to breakfast, then feed hay. At about ten o'clock I turn out to water to a tank containing a tank heater; feed more silage at eleven o'clock, when cows are put in. Turn out to water again in the afternoon, and in the evening milk and feed again. The day of letting cows run to corn stalks and hay stacks is at an end in Michigan.

Q. What is a good butter record for a cow? My cows average about 300 pounds of butter per cow per year? Is this a good average?

J. W. Hutchins: Yes, a very good average.

Q. How about cotton seed meal and gluten meal?

J. W. Hutchins: They show by chemical analysis a high degree of protein and are both excellent feed to add to corn stalks and timothy hay, or similar carbonaceous coarse feed.

Q. Is there much nutriment in the butt of corn stalks?

J. W. Hutchins: A very little.

E. A. Croman: I do not remember the figures as to the proportion of the total feeding value of the corn stalks that is below the ear. We are feeding a large number of cows on our farm, and our plan is as follows: We take the corn from the field in the fall and run through a shredder, putting the shredded stalks in a bay. This is used for roughage for the dairy cows, with roots for succulent feed. I believe that perhaps the only advantage of the silo is getting the corn off early in the fall so that you can sow wheat. We feed according to Bulletin 149 of our Experiment Station, nor have we ever experienced any ill effect from feeding roots. We feed mangolds whole.

Mr. Raven, Jackson County: My method of filling the silo has made me adopt these rules: Never commence when the corn is wet. Never put a man in the silo the first day. Let the silage lay up loose and heat and expel the air. When it is pounded down you get sauerkraut instead of silage. The second day put a man in to keep the silage level. When filled pack down well and put on two or three gallons of water per square foot. Milk, then feed. If my cattle leave anything, it is the part of the stalk just below the tassel. I believe that the silo has increased the capacity of my farm to keep cattle four-fold.

Q. The gentleman makes the statement that he is keeping four times the cattle on his farm that he could without the silo and still has feed left over. Does putting corn into the silo make the feed four times as valuable?

Mr. Raven: I will qualify my statement somewhat, but I believe I get three times the amount of feed on my farm that I have done heretofore, and this is largely because I use the silo. The silo does not make the feed more valuable, but it prevents waste and some way inspires a man to better practice in feeding.

A. M. Welch: My method of covering the silo differs somewhat from that of Mr. Raven. After the silo is filled I throw on plenty of water and then sow a half bushel of oats. The oats germinate and form a blanket for the silage. It seems to me that one of the chief uses of oil meal is to regulate the bowels. We do not need it so badly therefore where we use either roots or silage.

I feed my cows after milking at night and in the morning. I wish to submit some facts in regard to some of my cows:

SOME COW RECORDS.

A. M. WELCH, IONIA.

Sleepy, record for December, 1898:

	Pounds.
December 1 to 4—6 milkings	126½
December 4 to 11—14 milkings	323½
December 11 to 18—14 milkings	323½
December 18 to 25—14 milkings	324
December 25 to January 1—14 milkings	295
Thirty-one days or 62 milkings	1,392½

According to the Babcock test 62 pounds butter.

This cow got to eating 18 pounds of mixed grain per day. By adding two pounds of corn meal to this cow's ration she has not lost one pound of flesh and has increased her milk from 1,202 pounds in November to 1,392 pounds in December.

Record of Beauty for December, 1898:

	Pounds.
December 1 to 4—6 milkings	97
December 4 to 11—14 milkings	237
December 11 to 18—14 milkings	224
December 18 to 25—14 milkings	297
December 25 to January 1—14 milkings	207
Total	1,062

According to Babcock test, she made 68 pounds of butter.

We have had to cut this cow on her grain ration to 12 pounds of grain per day, and yet this cow has gained in flesh.

The cause of shrinkage in these two cows the past two weeks is change of feed from corn silage to siloed stalks and hay.

The ration I am feeding my cows at present is 25 to 32 pounds of ensilage, 9 to 11 pounds cut corn stover, 12 to 15 pounds wheat bran and buckwheat middlings, equal parts. This ration is varied according to the size of the cow and what she is producing.

I will give you a record of two of my cows, one a shorthorn, No. 36 in barn, weighing 1,250 pounds, and the other a Jersey, weighing 1,000 pounds, for the month of November: Shorthorn, Sleepy, freshened the 15th of October, gave last month 1,202 pounds of 4 per cent milk, according to Babcock test over 56 pounds butter. While this cow was dry she weighed 1,450 pounds. One week after freshening she weighed 1,350 pounds and December 3d she weighed 1,250 pounds. The other, a Jersey, No. 8 in the barn, named Beauty, weighs 1,000 pounds, gave 1,127 pounds of 5½ per cent milk in November; according to Babcock test, made 72 pounds of butter in thirty days. This cow is fed the same ration as the shorthorn, and has not shrunk a pound in thirty days. You can readily see by this the difference between feeding a large cow and a small one. While the shorthorn cow has not produced as many pounds of butter fat, she has been losing in flesh, and in order to keep her to her limit of production we will have to add more grain to her ration.

I have another shorthorn cow that I have a record of for one year. She is from the Young Mary family, weighs about 1,400 pounds. The sixth month of her milking period, in May, she gave 1,306 pounds and in August, the ninth month of her milking, she gave 706 pounds, and November, the twelfth month, she gave 340 pounds, or over 9,000 pounds in one year. Her test has run from 3.4 to 4.4 per cent, on a good average of 4 per cent making over 400 pounds of butter in one year. Our cows are fed a grain ration every day in the year, no matter how good the feed, and nine months of the year they were fed on ensilage. My dairy is run entirely to milk for the city market and the milk is well liked by my customers. We make no tests except such as a practical dairyman makes to decide for himself whether a heifer is worth keeping or not, and very few are rejected.

I have never attempted to boom any breed, but have always kept in mind that to make dairying profitable you must keep good cows.

BREEDING FINE WOOLS.

PETER VOORHEIS, PONTIAC.

An abstract of Mr. Voorheis' paper follows:

Every farmer following diversified farming should keep a flock of sheep to act as weed destroyers and to utilize waste land, if for no other purpose. He should keep the breed of sheep to which his inclination leads him. I advocate the Merino because I have been more successful with them than with any other breed, and because they have always paid, even during the depression. It may be true that there are years when mutton is high and mutton breeds give better returns, but taking one year with another I believe that it must be conceded that a good large plain Merino ewe, growing a Delaine fleece, will produce a lamb weighing nearly as much as a lamb from the mutton breeds, and bringing just as much per pound, while the fleece will bring enough more to throw the balance of profit on the side of the fine wools. You can keep many more Merinos than long or middle-wool sheep on the same area or on the same feed, and they will thrive during a dry time or on scant pasture where the others will not.

They will herd in large flocks and keep healthy. Their fleece being more dense and having the proper amount of oil, it is impervious to dust and rain, and renders them free from snuffles and disease. Moreover, they are excellent scavengers, and seem to prefer at times to browse on weeds than eat a good cow pasture. This is not true of the mutton breeds.

Again, our foreign competition is such as to relatively increase the value of the fine wools. In the Argentine Republic, where the sheep were formerly all Merinos, the type has been changed toward the mutton breeds. There is, therefore, a great falling off in the fine wool offered in foreign markets, and we need not fear competition until the price gets much higher here for the best fine wool.

I think the number of sheep kept in Michigan could easily be doubled at a good profit. On many of the new lands in the northern part of lower Michigan a flock of sheep would help to clear the land, and at the same time would be a source of income in three ways—a clip of wool, a crop of lambs, and increase of the fertility of the soil.

While circumstances may be imagined where the Merino would not be the best type of sheep, I firmly believe that most farmers could raise this type at a profit. The Merinos are truly the animals with golden hoofs. They clothe us, feed us, and help to fill our pocketbooks.

EARLY LAMBS.

L. W. OVIATT, NORTH WILLIAMS.

The time to begin to grow an early lamb is when you breed and raise its mother, from the fact that no sheep is prepared to bring into the world and care for a pair or more of early lambs with the best results that is not herself large, strong, vigorous, and of good constitution; and we should weed out of our flock with unsparing hand everything that does not meet these conditions. Having done this, and having each ewe bear her own mark and number properly recorded in the shepherd's book, we are prepared to set out to grow early lambs.

The period of gestation of the ewe is, on the average, 152 days, or approximately five months; and to grow early lambs the coupling, of course, must take place early in the fall. This naturally does not occur until cool or frosty nights come on, but the condition of the flock at the time has much to do with the results. To induce early coupling we should have the lambs weaned early and the ewes put into the best possible condition, on full feed and in perfect health, but not too fat. Then the ram should not be allowed to run with the flock, but only put in for a short time each day and then returned to his confinement, for, as you know, "familiarity breeds contempt." In this way the shepherd may easily know, by keeping his record properly, just when he may expect the lambs from each ewe.

Now, as to the winter care of the flock, we are strong advocates of an abundance of rough forage and little, if any, of the heavy grains or concentrated foods, because to these heavy foods, in our judgment, is attributable many of the diseases and weaknesses of young lambs, especially goitre. Nature intended that our animals should roam at their own sweet will and feed upon rough forage; and man often makes a grave mistake when he attempts to improve upon Dame Nature. Clover hay and roots or ensilage, with perhaps a few oats or oats and bran mixed would be as heavy feed as we would choose, and we should never allow our breeding ewes to get too fat; but better feed corn than allow the flock to run down in condition. I wish to emphasize the necessity of either roots or ensilage as a succulent food to keep the animals in perfect health; and as ensilage is so much cheaper and more easily prepared, we prefer the ensilage to roots.

Up to the time the first lambs are expected allow the sheep plenty of exercise and an abundance of pure water and keep in a cool, airy place. We need never fear our flock suffering from cold, provided they are at all times well fed and kept perfectly dry. Moisture is the natural enemy of the sheep, and they will never thrive in close, damp stables, nor do their best if allowed to stand out in the rain. One of the poorest uses that we know of that a farmer can make of good feed is in the maintenance of a crop of sheep ticks and lice. Grub in the head in sheep and hollow horn in cattle both have a peculiar connection, we think, with hollow stomachs.

When lambing time comes see that the sheep are kept in close, warm

quarters, with plenty of good, dry litter, being careful that there are no small nooks or places where the little lambs, in their first aimless wanderings, can get away from their mothers and become chilled. They seem possessed with a desire to crawl into some hole or crevice, and the colder they become the farther they will wedge themselves in, and there they die, not seeming to know enough to back out.

Just here let me say that should the little lambs from any cause become chilled, which will sometimes happen, even with the most careful shepherd, nothing in our experience will compare with the hot water treatment. We found and practiced this method for ourselves long before we ever saw anything written on the subject or knew of anyone else using it. Were I to tell you all the results we have had from this treatment, I fear you would take the statements with a grain of caution. But believe or not, as you please, we have seen lambs supposed to be dead restored by this treatment within thirty minutes so that they were returned to their mothers and ever after looked out for themselves.

We put the lamb in a pail and, holding its helpless head above the brim, we pour on as hot water as we can nicely hold our hands in, and as the water chills, pour off and repeat until the lamb is thoroughly heated up and the blood is sent bounding to every extremity. Now carefully rub dry, and if nothing ails the lamb but chill, he is ready for his dinner with a good lease of life.

It often occurs that the mother's milk does not come at once, and while the young lamb goes through the motions, yet he really gets no dinner at all, and of course, being weak, soon chills and dies. Or if, indeed, there be milk, sometimes a hard substance may have formed in the end of the teat, and the little lamb is unable to start the flow. The shepherd should always see that the teats are free and the milk abundant; or he should resort at once to his bottle of fresh cow's milk, which should be always on tap at lambing time. Here a word of caution. When feeding cow's milk, feed but little at a time and often, and let it be from a fresh cow if possible.

It sometimes occurs, especially with young ewes, that they do not own their lambs, or perhaps, having twins or triplets, may own one and reject another. We have found a simple remedy for this that works so completely that we have no hesitation in making the assertion that we can make any ewe own any lamb we wish. We make a small pen of narrow boards, about three feet high, three feet and two inches wide, and five feet long, being careful that the boards are close enough together so that a small lamb cannot get through. On each side, twenty inches from the end at the top and eighteen inches at the bottom, we nail a narrow strip down across the boards on the inside, with the edge against the boards. Now, on each side of these pieces, at top and bottom, we put strips across, between which to make the stanchion, and make a common stanchion as you would for a cow, only lighter and smaller. Now nail boards across the entire bottom of the rack under the manger end, forming a tight-bottomed manger in which to feed hay, grain, roots, etc.

Now, suppose we have a ewe that owns one lamb and rejects another. The latter will usually be the weaker one, that most needs its mother's care. We place the sheep in this rack, making fast in the stanchion,

Take the favorite lamb and put it down at the mother's head. She recognizes it and is very fond of it. Pass it back to the back corner, where we tie it with about eighteen inches of very light rope to a small malleable iron swivel attached to the rear corner post by a common fence staple. He can get his dinner all right, but cannot get to the mother's head. Now, the mother knows her lamb is there, although she can neither see nor smell him. Now drop the other lamb that she does not own down by its mate. She is not aware which lamb approaches. It might be considered a little mean, but we just fool her a little and the ruse works completely. We leave this rejected lamb loose, and through the places each side of the stanchion he will naturally run in and out around under the sheep's nose. Her mother's instinct soon exerts itself. She soon takes to the little fellow, and were you to keep the favorite lamb tied too long, you would find the conditions reversed and she would not be ready to own him. When the conditions are just right we open the stanchion and leave her loose with the lambs a day or two. Then she is ready to be placed in the apartment where the ewes with their lambs are kept apart from the main flock, so that they can receive extra attention and abundance of feed, and where the lambs will not be so liable to stray or receive injury.

When the little lambs are fairly started we provide a very tempting grain ration for them, where they can run to it at will and where the old sheep cannot get at it. Here we keep a variety of feeds. We use oats, bran, middlings, corn meal, or mixtures, as they seem to like them best. It is wonderful how soon the little lambs will take to some kind of grain food and how they will grow and thrive on it.

To illustrate this, on Monday last I went to the sheep pen and caught and weighed three lambs. They were not all the largest, but of different ages, to determine what gain they were making per day. One 20 days old weighed 22 pounds; one 21 days old weighed 23 pounds, and one nine days old weighed 15 pounds. Now understand this is no guess or estimate. The weights were carefully taken, the dates carefully kept and honest calculations made. Neither do we consider this a phenomenal growth. It is safe to say that when the flock is managed as I have suggested, the lambs will gain a pound per day, or will at least weigh as many pounds as they are days old.

We usually dress our earliest lambs at Easter time, realizing from 16c to 20c per pound, making them bring from $4 to $6.50 per head.

By the use of the stanchion and pen we have described, we graft other lambs from ewes having twins or triplets on to those ewes from which we killed Easter lambs with perfect success. When this is done, the ewes often become very vicious and will persistently fight the approaches of the young stranger. When this is the case, bore a hole in each stanchion, close to and below the swell of the sheep's shoulders, and cut two notches in the board at a corresponding height behind her, so that two small sticks, like rake handles for instance, can be thrust through the holes and drawn up close under the swell of the body against the sheep and dropped into these notches behind her. In this way she will be compelled to stand still and cannot lie down on the lamb, as she will try to do. Soon she will cease her resistance and become as fond of the young lamb as if she had been its real mother. We have found by experience that they make excellent step-mothers.

We can in this way divide up the burden of lamb raising so that no ewe will be compelled to keep more lambs than she is able to care for. Those lambs not disposed of at Easter time can be sold at high prices to fill an ever increasing demand for very early lambs, at figures that make a handsome profit to the producer; and his ewes are relieved of their burden early in the season and will thus be prepared to breed early, ready for the next year's harvest. But should he prefer, he can feed them over and again get fancy prices for Christmas lambs; or, if he has plenty of grain feeds, he can feed for the spring market, shearing early in February, and get even greater prices.

Sheep managed in this way should yield a return in wool and lambs of from $6 to $10 per head, according to the length of time the lamb is fed, and the price received; and we very much question if any other farm stock will yield as much for food consumed and labor expended.

Moral: "What is worth doing at all is worth doing well."

Mr. Welch: I can feed 640 lambs in ten minutes, and this without frightening the lambs or causing them to pile up. The men do not have to get in the pen with the lambs at all. Between each two adjacent pens and separating the lambs is a rack and feeding trough combined, from which the lambs may be excluded by dropping a board on each side. This board is dropped from the aisle which runs lengthwise of the barn and divides it into two sets of pens. From this aisle a man may walk down the rack and sweep it out, and then put in the grain. The boards are then raised and the lambs allowed to eat the grain. The silage and hay is fed into the rack from the floor above. Human labor is thus economized, with the result that the past season it has cost but three cents for each pound of grain, and the lambs made an average gain of two pounds per week. Naturally the lambs have plenty of light and pure air, and have fresh water by them all the time.

SHEEP RAISING ON THE FARM.

A. B. COOK, SHIAWASSEE COUNTY.

We have listened with pleasure to the talks by our many dairying friends this morning, and now are given five minutes to speak a few words for the sheep on the farm.

One dairyman present at this meeting told me that he keeps seven hired men, all boarding in his own home. Another, that this is his first "outing" from home in over two years.

When one gives up his home life and his time all days of the week, and puts up with the many discomforts which the dairyman must, he is surely entitled to the nice income which the good dairyman who puts his product on an appreciative market receives.

Can we not find some way to conduct our farms with profit and at the same time have liberty to a degree at least for ourself and family, and be quite independent as to hired help.

The advantages of sheep are the ease with which they are cared for, the ease with which they are fenced against, and the fact that the sheep, where good mutton qualities are combined with a good, heavy fleece of wool, are found to be almost always money makers. Sheep have always been admitted to be one of the very best soil improvers in the line of stock.

As to kind of sheep, I am sure that the farmer will do better to combine mutton and wool. My flock of grade sheep, bred up with Lincolns, do this; many other breeds do the same.

Sheep are often neglected, so do not do their best for the owner. Some of the ways are: 1st. Feeding lice and ticks on the sheep and lambs. This is very bad practice. By all means dip often enough to keep these pests cleaned out of your flock. 2d. In not providing a fresh pasture for the lambs anyway, and sheep too, if possible, through the usually hot, dry months after July 1st. Rape is a great help in this matter.

I shear my ewes in February, as I have a very warm barn, and find it better for both ewes and lambs. I would not shear if I could not keep the ewe comfortably warm, as the keeping of stock comfortable is the first principle of success.

As to feed, a variety is a great help. Clover hay, bean pods, corn stalks, early cut timothy, may be used to advantage. Timothy hay, as usually cured, is very little use. The grains raised on Michigan farms are all good for sheep. Corn is the dependence for fattening, while oats are better for the breeding ewe. Silage or roots are excellent for sheep, as the succulent food helps to keep the system regulated.

With good sheep and good care a good profit is almost sure. While sheep are small and modest, surely they have qualities which richly entitle them to the high esteem in which they have always been held.

THURSDAY FORENOON.

PARLORS, NEWBERRY HALL.

Conference between Dr. H. W. Wiley, Chief Chemist of the Department of Agriculture, Washington, D. C., beet growers, and representatives of the sugar factories.

THE RELATION OF FACTORY TO FARM IN THE BEET SUGAR INDUSTRY.

R. C. KEDZIE, AGRICULTURAL COLLEGE.

The Agricultural College for years has taken a deep interest in securing for our people a domestic supply of sugar. For a time hopes were entertained that sorghum was the plant adapted to our soil and climate which would meet this want. A liberal supply of the seed of Amber cane was purchased and freely distributed among our farmers for trial, and experiments in the growth of the cane and making sugar were carried on at the College and elsewhere. When it was found that the proportion of glucose to cane sugar in the sorghum was too

large to permit of profitable manufacture of crystallized sugar, attention was turned to the sugar beet as a more promising material.

SUGAR BEETS.

Ten years ago 800 kilograms of the seeds of the best known sugar beets were imported from Europe for trial in this State. This included 200 kilograms each of the four most highly prized sugar beets cultivated in Europe, viz.: Klein Wanzlebener, Austrian Wohanka, White Silesian and Vilmorin Imperial Improved. The seeds were given to the farmers, with directions for planting and cultivating, and with request for samples of the beets for analysis. About 400 farmers received the seed in widely distributed localities, and a large number of beets were analyzed and the results given to the public in Bulletin No. 82.

The result of these investigations was a demonstration that the soil and climate of Michigan were adapted to produce sugar beets of excellent quality, well fitted for making sugar. While this experimental work did not evoke a single factory, it laid the foundation for a future industry by furnishing the facts upon which it must rest.

FRICTION AND READJUSTMENT.

In starting a new industry, as in starting a new machine, some parts need readjusting before everything works smoothly. It is not strange that in this new line of work, involving on one hand the raising of a new kind of crop, on the other the manufacturing by complex machinery of a commercial product, with conflicting interests so far as division of profits is concerned, with an arbitrary law controlling these relations of factory and farm, that friction and disputes should arise; the wonder is that there is so little of either. Too great expectations of some and exaggerated disappointments of others did not simplify the matter. Some assumed that with beets containing 12 per cent of sugar, the factory should produce 240 pounds of granulated sugar from every ton of such beets, and when they found that the average product in the State was only 142¾ pounds, dissatisfaction found open expression. The protracted drouth in some districts reduced the beet crop below any profit to the farmer, and possibly the wheat crop by the same drouth may have brought loss. But one defeat does not vanquish the plucky Michigan farmer, and even in the shadow of defeat he plows in hope, with expectation of a future harvest.

But there is incidental loss in every manufacturing operation. The carpenter finds waste in shavings, saw dust and ends; the metal worker in smelting iron and copper ores does not recover all the metal, for a certain portion is carried off in the slag. So in extracting sugar from beets, the manufacturer that recovers 80 per cent of the sugar in the form of granulated sugar does well. This would give 192 pounds of commercial sugar from each ton of 12 per cent beets. The sugar retained in the molasses may be called the slag of the sugar factory.

DISTRUST OF ANALYSIS.

Perhaps the most serious cause of dissatisfaction arises from distrust of the analytical results reached by different chemists. Beets from the same field sent to Washington, to Agricultural College and to the fac-

tory often show decided variations in the amount of sugar; even beets from the same patch will sometimes show decided difference when analyzed by the same chemist at the factory. Why is this? Is the chemist incompetent, or the method unreliable? Before discussing the discrepancies, let me briefly state the

METHODS OF ANALYSIS.

The most common method is to pulp the whole beet, after removing the crown, express the juice, estimate the total solids in solution by a brix spindle, clarify the juice by a lead salt, polarize the juice to determine the per cent of sugar in solution, and then from the relation of total solids in solution to the sugar present determine the co-efficient of purity. This will give the per cent of sugar in the juice, and it is so reported from our laboratory.

Another method sometimes used is a modification of Pellet's diffusion process, where 26.048 grams of pulped beet are placed in a flask and water filled in till it measures 100 c. c., the whole heated in water bath to 85 degrees C. for an hour, decolorized by lead salt, filtered and polarized to determine directly the per cent of sugar. While this process takes more time, it more nearly approaches the conditions of diffusion in the batteries where the sliced beets are treated with hot water, but gives results about one-half per cent lower in sugar than the method by expressing the beet juice. The Michigan law, however, prescribes payment according to the amount of sugar in the beet, not the amount that can be extracted by the manufacturer. So long as the factories claim the benefit of our bounty law, they will have to keep within the limits of its enactments.

CAUSES OF VARIATION.

Let us now return to consider some of the causes of variation in the content of sugar in beets.

1st. The sugar beet is a very highly developed plant, producing an abnormal amount of sugar on account of stimulating breeding and careful selection of parent plants to produce the seed. The plant from which the whole sugar beet race has sprung is the White Silesian, which at the beginning (1747) only contained about 7 per cent of sugar. The large increase in the modern sugar beet has come from breeding and selection. All races, animal or vegetable, abnormally developed in any direction, tend to revert to the original type unless the conditions of unusual development are fully maintained. The breeder of blooded stock knows this, and the breeder of blooded plants finds it equally true. When the original White Silesian, with 7 per cent, was developed into Klien Wanzlebener or Vilmorin, with 14 to 16 per cent, is it any wonder that individuals in this class may fall back a few degrees? In the great beet seed plantations of Germany, where beets are bred by pedigree and every mother beet is tested for its content of sugar, it is often found that daughters from the same mother, growing side by side, will show beets of widely variant quality in the amount of sugar. Beets that fall below a certain standard, though having a good pedigree, are rejected as candidates for mother beets. If beets with the

best ancestry and careful cultivation may degenerate to the point of rejection in Germany, why may not a similar falling off be expected in America?

2d. Sampling the beets.—One of the difficulties the chemist meets is to secure a fair sample of the material he is to analyze, whether from a car of coal, the soil of a field, or the beets from a wagon load. Few persons realize the nature of this difficulty, but the true value of his analysis will rest upon the fairness and justness of such sampling. To take extreme samples, whether of excellence or inferiority, would be equally unfair and misleading. Sugar beets out of the same field and in the same wagon load often will vary widely in value; a conical beet, well developed, will differ from an ill-shaped, poorly developed tuber. Which shall be taken for analysis, or what proportion of each in a mixed load? The custom of the weighman to select a representative proportion of each kind seems to be fair, but requires good judgment. To select only the best beets for analysis would seem unfair to the manufacturer, who has a right to demand an analysis which shall represent the average of the crop. A quantity of the beets containing in equitable proportion the different qualities of the beets in the load would approximate this average result. But the beets sent to Washington or the Agricultural College for analysis are the best to be found in the lot, and the higher results reached by these chemists as compared with those of the factory chemist on the average of the beets awakens the suspicion of the farmer that he is being cheated at the factory. Both chemists may be correct, but they are dealing with beets of different quality.

Beets sent to a distance for analysis, and thus many days out of the soil, in a warm and drying atmosphere, and wrapped in paper or other drying material, must be richer in sugar than when first taken from the ground. A 12 per cent beet, by parting with one-eighth its water thereby becomes a 13.5 per cent beet. Wilted beets often are sent for analysis, and the wilted condition is stated in the report of analysis, but this fact is omitted in the results printed in the newspapers.

Take together these two factors—the selected beets of better quality than the average crop, and the drying of the beets before they reach the chemist—and it is not difficult to see why the results of analysis should be 2 to 4 per cent higher than the results found on fresh average beets at the factory. We fear that in this way we have unwittingly done the factories an injustice and misled the farmers on an important point. How to select fair samples of beets and how to preserve them in normal condition for analysis are questions now under consideration.

An illustration of unconscious deception may throw light on this subject. Some beets were sent for analysis, perfect in form and giving promise of good results on analysis, which showed 17 per cent sugar and 85 per cent purity. Inquiry was made as to whether these beets properly represented the average of his crop. "Oh, no; these beets grew on a spot where a straw stack had rotted down, and the beets on this spot were so superior to those growing on the rest of the field that I sent them for analysis."

TARE.

The estimation of the tare or the reduction from the gross weight of beets in consequence of excess of dirt adhering to the beets, and excess of the crown of the beets, has given rise to misunderstanding and dissatisfaction in some cases. It is desirable that cordial relations should be maintained between the factory and the farmer, and friction on this point avoided. The weighman is supposed to be impartial between the parties and is appointed by the Commissioner of the State Land Office, takes the oath of office and files a bond of $2,000. A dissatisfied patron would seem to have a remedy either on the oath or bond against unfair treatment in determining the proper deduction for dirt and dockage. The law is fair and reasonable, and practically the method is in use in all the beet sugar factories in this country. To take from the body of the beet the dirt that can readily be removed by a small broom and cut off the crown of the beet unsuited for making sugar, would seem to be fair and just, beyond these would arouse opposition.

It may be that weighmen have failed in some instances to fairly and impartially discharge the duties of their office. I am not here to champion the weighman. If they are weighed in the balance of justice and found wanting, the remedy is within the power of the aggrieved party, for "courts are open and there are deputies."

If it is decided that the tare shall consist only of dirt removable by a broom (not by washing), or the crown that rose above the soil surface, and the beets used for such determination shall fairly represent the average of the load, the method seems fair. But no other part of the beet should be removed as tare. The long tap root is as valuable for making sugar as the body, and should not be counted as tare.

The questions of pitting the beets and cost of the same, the time and manner of delivering to the factory, and all others of business detail, must be arranged between factory and patron on the same principles that govern in all business. The golden rule will bring gold to both parties.

The marc, or solids not sugar, in beets, is becoming a subject of controversy. It has been lumped off by saying that the marc in sugar beets averages 5 per cent. Whether the marc is uniform is questionable. Some small beets, weighing from 5 to 8 ounces, averaged only 11 per cent sugar in the juice, and it is probable that the marc was greater than in well grown beets which contained 14 per cent of sugar. Some factories claim to find from 5 to 8 per cent of marc in beets, and occasionally as high as 16 per cent. It is possible that the estimation of marc in sugar beets demands re-examination. It certainly does if the foregoing statements are well founded, for it would signify much to both farmer and manufacturer.

MICHIGAN BEET SUGAR DOES NOT REQUIRE REFINING.

Our factories produce sugar so pure as not to need refining, but is ready for table use just as it comes from the factory; in German parlance, "Sugar of consumption and not sugar for refining." It does not

have to pass through the hands of the sugar trust and thus escapes the exactions of that great monopoly. Do you know that the sugar trust fixes the price at which sugar must be sold in every city and village in our land? The only untaxed white sugar is the beet sugar produced of such excellence as not to need refining. This is our only way of escape from the sugar trust. It has been darkly hinted that beet sugar is not as good as cane sugar; that preserved fruits and jellies made with beet sugar will not keep, etc. I placed some beet sugar from the Michigan Sugar Co. in the hands of the domestic department of our College, to be tested as to culinary quality, and received a tumbler of jelly of such beauty that it was threatened with "quick consumption." The fact is that for two years past about the only granulated sugar used in Michigan has been beet sugar.

The supply of cane sugar has been cut off from the West Indies and Philippines on account of the Spanish war; none reaches us from the Sandwich Islands, and Louisiana makes no more than is required by her people. The question remains, Shall we use our home product or depend upon beet sugar imported from Germany and France by the sugar trust, paying any tax that monopoly may impose? When we think of the large dividends the sugar trust bonds are said to pay, how easy to place these bonds in the hands of our national legislators when questions of revenue come up for consideration, and the trust, which was once for tariff on sugar, is now for free trade. I recall the words of the Good Book, "Put not your trust in princes."

The reading of Dr. Kedzie's paper was followed by a discussion of the points treated. The first question taken up was that of the method of sampling at the factories. The method most generally employed is to have a man appointed for the purpose, who visits each load of beets as it is being unloaded and takes from the load a half bushel of beets to be cleaned and tested, to determine first the tare and afterward the per cent of sugar. Minor differences in the details of selecting the beets from the wagon load to put in the basket were mentioned. In most of the factories the assistant, who is pledged to do exact justice between the parties, sees to it that when the farmer fills the measure he does so with beets that fairly represent the load, as to adherent dirt and topping and shape and as to being conical or prongy. The consensus of opinion seemed to be that while a given half bushel might not fairly represent a given load, still with the samples taken, using fair judgment, as indicated above, the average for the whole crop of the farmer will be fairly represented by the samples taken.

In sampling carload lots it is customary to take two samples, one from toward each end of the car.

Little dissatisfaction was reported with the method of taking samples. It was generally agreed that with competent men to do the work the present methods do not need change. Politics, however, should play no part in the selection of the men who thus represent both the factory and the farmers. These men must be neither ignorant nor dishonest.

The next question was as to the method of treating the representa-

tive half bushel thus selected. How shall the dirt and the part of the beet not removed by proper topping be removed, and how shall the juice to be tested for sugar be taken?

Dr. H. W. Wiley said in substance as follows:

I do not think that injustice has arisen from the use of the methods that have been mentioned, except possibly from carelessness and incompetency. We find in all kinds of chemical work a great difficulty in securing correct samples. The chemists resort to an amount of work which the layman would consider unreasonable to thoroughly mix the material to be analyzed, so that the small sample taken shall fairly represent the bulk of the material under investigation. It is impracticable to shovel the beets over and over, nor do I think it necessary. While a given sample taken somewhat at random from a given load may not fairly represent that load, either in per cent of tare or content of sugar, where many loads are delivered from the same field, the average of the samples so taken will differ but little from the average of the loads delivered. In fact, two beets which look alike and which grew on the same row under identical conditions may differ 1 or 2 per cent in the sugar they contain. To get the average quality of a given row we should have to analyze a large number of beets. This is what is done at the factory under the system now universally adopted.

Resort is had to various means to properly sample an individual beet. Perhaps the most common method is to take the beets one by one after they have been cleaned and properly topped, quarter them and pulp one-quarter of each beet in the half bushel. The juice from the pulp so obtained may fairly be supposed to represent the average juice of the whole load.

By marc is usually meant the content of fibre and other insoluble material in the beets. The factor fairly universally adopted for marc is five, that is, it is assumed that five per cent of the beet is marc and ninety-five juice. The mean factor in use all over the world for reducing per cent of sugar in juice to per cent of sugar in beet is .95. The per cent of sugar in the juice is multiplied by .95 to determine the per cent of sugar in the beet.

In answer to the question whether beets would ever contain 14 per cent of marc, Dr. Wiley stated that so high a percentage of marc would indicate that either the analysis was not properly made or the beets were better adapted to fire wood than the sugar factory. Any payments made on a basis of that kind would be a great injustice to the farmers.

The Chemical Division of the Department of Agriculture at Washington has analyzed a great many thousand samples of beets. The results of these analyses confirm the well-nigh universal experience of Germany and the older beet growing sections of this country that the normal amount of marc is 5 per cent, rather under it than over it. It is true that where beets have lain a long time in the heat or where by reason of warm, wet weather in the fall a second growth is started, there may be a slight increase in the per cent of marc. It is also true that drouth may make an abnormal beet, but the conditions would have to be unusual indeed where the per cent of marc would reach 7, and 8 per cent would be a figure so high as to make one

suspect that the sample was taken from a mangold rather than a sugar beet. It must be remembered that sugar beets are biennials; they complete the growth of the root the first year, and as soon thereafter as conditions favor regrowth the initial steps incident to sending up the seed stalks begin. In this process the sugar stored up in the root is taken up in the making of fibre. While the other constituents remain the same, therefore, the relative proportion of sugar is lessened.

The beets should, of course, be properly trimmed when they are delivered to the factory. If they are not properly trimmed this fact must be recognized by the tare man, who will cut off the crown down to the point where it should have been removed in the field, this means down to a plane perpendicular to the vertical axis of the beet below the base of the bottom leaves. The crown of the beet corresponds to the stem or trunk of the tree, and contains salts that prevent the sugar crystallizing. It is fair to the factory, therefore, that the tops should be cut off below the base of the lower leaves; if this is not done in the field then it must be done by the tare man.

In answering a question, Dr. Wiley said that he had never heard of cutting off the lower end of the root below where it is three-quarters of an inch in diameter or less, nor could he see any reason for so doing. It was true that in the distribution of sugar through the beet some experiments have shown that the middle portion may be richer in sugar than either the top or the bottom part, the variation is too slight to be recognized in this way.

The method of using a kind of buzz saw, cutting through the center of the beet, does no injustice to the farmer. In selecting mother beets for seed growing still another method is used, that of taking out a small core running diagonally through the beet. This core is pulped and tested. Where the per cent of sugar found is high enough above the standard the beet is safe to set out to grow seed, and the removal of the small core does not injure it for that purpose.

The co-efficient of purity is an important element. Where that co-efficient is high the amount of sugar which a factory can secure from a ton of beets is proportionately greater than when it is low. The co-efficient of purity is influenced by many factors of the environment of the growing beet, usually black soils rich in organic matter produce beets with a low co-efficient of purity. On the other hand, sandy soils or sandy loams yield beets with a high per cent of purity.

The kind and amount of fertilizers used and the methods of application have much to do both with the quantity of the yield and the purity. In the first place, farm yard manure should be applied fully a year before beet seed is sown. It must be thoroughly incorporated in the soil and quite fully decomposed. The application of superphosphates and potash salts is also to be recommended. Two or three applications of nitrate of soda at the rate of 100 pounds per acre for each application is to be recommended. Hard wood ashes is also a good fertilizer. Lime is to be recommended for both sand and clay. It flocculates the clay and makes it more friable. On the other hand, it binds together the sand and makes it less leachy. Two sources of lime suggest themselves to the Michigan farmer—one, marl, is widespread over the State, and is a good source of lime, although the marl requires intelligent

handling. The press cakes and refuse lime from the factory is the second most evident source of lime. In Germany these lime cakes bring a good price, in this country they are surely worth hauling.

The loss of the refuse molasses, containing as it does a large proportion of the potash resident in the original beets is greatly to be regretted.

Attention was then called to the fact that beets begin to lose in the per cent of sugar as soon as they are put in the silo. They are living plants, and the vital process continues at the expense of the sugar. In the fall, when the beets are fully ripe, it may be a wise proceeding to run the lifter along the row when rain is anticipated to break the tap roots. This will aid in preventing the decrease in per cent of sugar if warm, wet weather follows.

Professor Trowbridge of the University advocates washing the beets, as done at the Bay City or Alma factory, in determining tare.

Mr. McFarland reported that washing the samples reduces the labor in the tare room by fully two men.

Mr. Scheibler said that he did not think that 95 was quite the fair factor to be used in converting sugar in the juice to sugar in the beet. He has made many analyses, using both warm alcohol and warm water, with results indicating that from 91.5 to 93.5 were the proper factors in those cases.

Dr. Wiley recommended the use of corn stalks and dried pulp as stock food. The corn stalks are thoroughly dried, then ground, and mixed with dried pulp. If to this mixture some dried blood be added an admirable stock food results.

It was reported that one factory at least would, during the campaign of 1900, allow the farmers to haul the beets as fast as they chose and the factory would receive them and care for them until they were wanted for slicing. Some farmers regard the pitting of the beets as an expensive item which they ought not to bear, while others prefer to pile them up and cover them with tops or with dirt, to haul them later when there was more leisure time.

THURSDAY AFTERNOON.

NEWBERRY HALL.

Wm. Campbell in the Chair.

QUESTION BOX.

Q. How much rape seed per acre is required in drills and broadcast?

C. D. Smith: I think that heretofore we have used rather more rape seed than we ought. When sown in drills twenty-eight inches apart I would not use but two and one-half pounds per acre on good soil, and when sown broadcast, which is the better method in most cases, I would not use over four and one-half.

Q. Which is the most desirable variety of cow peas for Washtenaw county?

J. D. Towar: The Early Black Eye, Red Ripper. A variety for large growth to plow under is the Clay.

Q. Will not drilled corn stand more dragging than planted corn?

J. D. Towar: In most cases, yes; largely because an excess of seed is almost universally put on when it is drilled.

Q. Has anyone had any experience in sowing clover in the fall?

A Benzie County Farmer: On light soils we sow in the fall in our county. We sometimes sow in the corn, after the last cultivation, with good results.

L. D. Watkins: It does not work well with me, as I have sown forty acres and lost it.

A Farmer: I have sown twenty acres, and lost it, and have tried the experiment several times.

Q. What shall be done to save the shade trees along the highway from the ravages of the telephone men?

C. D. Smith: Unfortunately, the courts do not give sufficient protection in this matter. The right to set the poles carries with it the right to cut the shade trees as far as may be necessary to run the wires. This, at least, is the way I understand it.

Q. How would you get permanent pasture on sandy land?

L. D. Watkins: It is a hard proposition, and in general cannot be done. June grass is the best attempt. Everything depends on the first season. It is even possible that that vilest of weeds, the quack grass, might be used if the land would never be wanted for any other purpose.

Q. In putting up shredded corn fodder, do you let the stalks get perfectly dry, or do you haul immediately after cutting, and shred at once?

E. A. Croman: We have the stalks just moist enough so that we can squeeze juice out of them. We do not wait long enough to have them perfectly dry.

Q. Will oat and pea hay and corn silage make a perfectly balanced ration for cows?

E. A. Croman: Yes, nearly so. It would pay, however, to buy bran or oats or some feeding stuff rich in protein to fully balance the ration.

Q. In plowing an apple orchard, should it be plowed deep or shallow?

S. H. Fulton: It depends on the previous culture somewhat. As a general rule, it should be plowed shallow.

Q. What would you suggest as a winter cover crop for an orchard to be plowed in the spring?

S. H. Fulton: Either oats or crimson clover.

Q. Would you advise rolling wheat immediately after sowing?

A. M. Brown: I can see no advantage in it, and there may be some disadvantage.

Q. Would not the loose soil in a seed bed for wheat cause deep rooting and consequent winter killing of the wheat plants?

A. M. Brown: Yes, if the loose soil was too deep; for this reason I advocate a fairly firm lower soil with a soft earth mulch on top.

Q. What will destroy the apple borer?

S. H. Fulton: Dig them out when you see the borings at the foot of the tree.

Q. Will marl be a benefit as a fertilizer for apple trees?

Dr. R. C. Kedzie: Yes, sir. It should be allowed to freeze first and then spread upon the soil.

Q. Shall we plow or drill in peas?

F. A. Croman: I drill in two bushels to the acre, using a drill with the teeth weighted with a log chain.

Mr. Morris of Monroe: We plow them under with a gang plow.

Q. What about brome grass?

C. D. Smith: Brome grass is a coarse grass adapted for light sandy soil.

NEW IDEAS IN FRUIT GROWING.

L. H. BAILEY, PROFESSOR OF HORTICULTURE, CORNELL UNIVERSITY.

The speaker explained at some length the gradual change or evolution in ideas respecting the growing of fruit from the early history of the country until now. He developed the fact that in the early days to be a Pomologist was to know varieties, yet at the present time one may be regarded as an authority on pomology and know very few varieties. In Downing's book of several hundred pages very little was said about the tilling of the soil and there was no attempt to treat the matter from the point of view of underlying principles. The older generation, of pomologists who knew hundreds of varieties, is now nearly past. One of the last of this generation was T. T. Lyon, whom the speaker enlogized. The fact is that varieties are personal and local facts, but the methods of tilling the land, feeding trees, pruning, and the like, are questions which are fundamental and which apply wherever trees are grown. The speaker also developed the fact that in the old days one asked for advice and expected to receive specific directions. He was told just how a thing must be done. At the present day one asks for advice and expects to receive suggestions. He is told the reason why. He then applies the advice to his own circumstances as best he may. It was a relatively easy matter in the old days to give specific directions because the area in fruit growing was small and the purposes for which fruit was grown were few. At the present day there are as many purposes and ideals as there are growers. Markets have become much extended and greatly diversified. More kinds of fruits are grown. Enormous areas are devoted to the business. It is no longer possible for a man to give specific directions for anything more than specific cases. Even then his advice is better and safer if he states some of the fundamental principles, than it is if he merely gives directions.

In the old time the teacher was a *multum in parvo*. His advice was supposed to be final. When his advice failed he was discredited. In the present time a teacher is merely a guide. He suggests, and if his advice fails it is quite as likely the fault of the recipient as of the giver. In the old days the teacher was supposed to do the thinking and the experimenting for the grower. At the present day the teacher sets the grower to thinking and experimenting for himself and merely guides his work.

It is now taught that there is no short cut to successful fruit growing. A man must have all the factors in his hands and must manage them largely for himself. Executive or business ability counts for quite

as much as specific scientific knowledge. All this is well illustrated in the replies which are now given to questions respecting fertilizers. There is no one fertilizer which is best for all plants, nor even best for the same plant on all soils or for the same plant in different years of its life. A man must determine for himself what fertilizers are needed by actual experimenting on his land. The teacher will tell him how to experiment and he will guide him in such a way that the experimenter can arrive at results several years sooner than he might without such guidance. It is now known that the fundamental thing in the growing of fruits, as in anything else, is tillage of the soil. Fertilizing is at least only secondary. One can never till well, however, unless he knows the reasons for tilling, for every soil and every season will vary the requirements. The speaker explained the importance of mixed planting to insure pollenation; outlined some of the principles of pruning, and discussed the principles which underlie the selection of varieties. In the selection of varieties every man must be his own guide. He must first determine what he wants his fruits for. If he wants them for market, for canning, for distant shipping, for export, these facts should have much to do in determining the choice. The lists of varieties are, at the best, only suggestions. Each man must work it out for himself.

LESSONS OF THE YEAR IN SUGAR PRODUCTION.

DR. H. W. WILEY, WASHINGTON, D. C.

Reported by Michigan Sugar Beet.

The subject upon which I am to speak this afternoon is one interesting to agriculturists of Michigan to a great extent. I was entirely ignorant of the subject upon which I was to speak until after I had seen the program, being in this respect like George Francis Train, who, appearing before an audience for the purpose of lecturing, suggested that he would speak from any subject they might propose. I have, however, the permission to say a few words on another subject just as important as the one assigned me, and this I will do at the close of the present talk.

In treating this subject I will confine what I have to say to my own observations. It was my privilege to spend a large part of last summer in the state of California, and I wish to say to you this afternoon a few words relative to what has been accomplished in this important industry out there. The conditions of cultivation in California are, to say the least, unique; and are occasioned largely from the fact of the very slight rainfall peculiar to that country. Beets grown in California are grown without irrigation, depending upon the moisture that is in the soil and air rather than that which may be supplied. As I said, the conditions here are unique, as compared with those of other localities; and this is due to the fact that the cultivation of the surface is so carefully conducted. This, together with the fact that the snow melting in the mountains supplies water which percolates through the soil, thus supplying it to a large extent with moisture which in other localities is applied in a different manner. This permits the beets to receive the

benefit of the moisture and at the same time the evaporation from the surface is reduced to a minimum.

Then, too, the seasons out there are peculiar. The agriculturist begins to plant his beets in January, and they ripen early in the summer. From January on they plant field after field up to the middle of May, so that beets are growing and maturing through a greater portion of the year. This gives the Californians an advantage which is not found anywhere else in the world. There, too, they derive another advantage from the fact that they do not have to protect their crop from the cold. Out there we find no such thing as a silo to guard against the low temperature as in a severer climate, although they are sometimes siloed to protect them from second growth. During the last two years the seasons in California have been remarkably trying, the average rainfall being only about ten inches, and that during the winter time. These growers, however, don't expect the rain, and usually don't get it, so they are forced to make provision to meet this lack of moisture without any help from the heavens; and during the last season and the season before, although the rainfall has only been about one-half, even with this, fair crops have been grown. On the other hand I saw many fields where there was no crop at all, especially was this true around the factory built by Mr. Spreckles, the largest factory of the kind in the world, while in other localities still I saw reasonably good crops, although none of them were more than half the average crop, although the area under cultivation was very much greater.

That is one condition of this industry, and I will say that all conditions may be classified under four heads, the one I have just mentioned, which is possible in California. The second is the growth of the beet under irrigation. This second condition marks a point of progress which is encouraging because it increases the area upon which the growth is possible. The first use of irrigation in connection with this industry was made in Utah, and is most firmly established there, the farmer finding the growth of beets his most profitable crop.

As a general thing in the localities where this industry is in its infancy and new factories but recently set in operation, the first year's work is not satisfactory either to the factory or the farmer. Even in the old country, whenever a beet factory is built in a new locality, the first year's work is not satisfactory, because it requires a number of years' education to bring about that condition of affairs. And so, while I have not heard from other factories in localities where irrigation is used, still I am ready to believe they are not so successful as the one to which I have just referred in Utah. It is my belief, however, that there is a great opportunity for progress under this condition of sugar beet culture in this country.

Now, it is evident that under this condition of irrigating the land upon which the crop is grown, the beet must bring a great return. It is necessary to raise such crops as will pay for the investment, and in doing this I think the growth of sugar beets will pay this investment better than any other crop. All you need is the sunshine and warmth, and you are certain of your returns in a crop. These conditions of warmth and sunshine, however, are indispensable, but when it is once realized that these are the most potent factors in the development of the crop, vast areas will be converted into sugar farms.

I said there were four types of cultivation. Having mentioned two, let us now look at the remaining two. The third type is exemplified in Michigan, Ohio and New York. We have in these states and through this section of the country peculiar meteorological conditions which favor the growth of the sugar beet. You will notice on the map which I have recently constructed that these portions of the country are especially designated as peculiarly fit for this growth. Here you have a reasonable amount of heat, light and rainfall. Then, too, the beet grows much more readily in this northern climate than it does in southern latitudes, for the reason that during the summer there is more sunshine in the north than there is in the south. Increase the sunshine and you increase the sugar. Every hour during which these precious little rays of sunlight may do their potent work is an important one.

Another reason, too, why the northern latitude is more congenial to the growth of the beet is from the reason that in the scorching sun of the south the beet is roasted on the surface and therefore not properly developed. There are also extreme wet seasons and drouths. The beet likes an equable climate, and as you go a certain distance north you get that condition.

Now you wonder why I did not mention points further west; for instance, Nebraska and the Dakotas. The reason is this—here at times we have a deficit of rainfall, and even though the same conditions of sunlight and warmth prevail, there is apt to be extremely dry summers; again, the cold of winter is apt to come on very suddenly. It is for these reasons, therefore, that I consider the conditions better in or near the lakes rather than in the arid regions.

Notwithstanding this, however, splendid beets are grown in the Dakotas; but Michigan, Ohio and New York, it seems too, present to us the best and most favorable conditions of our country, and therefore the greatest growth and development of the industry must take place here.

Now, the fourth condition under which the sugar beet has been grown is to be found in those regions just south of the territory just referred to; and I may say that no little capital has been invested in the business in these localities. More than this, a great deal of money has been invested where the business had, in my estimation, better have been left alone. The business is one that does not require that a very large tract of land shall be put under cultivation, and from that reason we will find in the future that it will be necessarily confined to those portions of the country where conditions are most favorable.

It has been said that Lee finally hammered Mead into a good position at Gettysburg; that the Union leader did not at first take up the position which was best from the natural contour of the land, and that it was not until Lee forced him into that position that he was able to win the battle. And so it will be with the sugar beet industry. The business will gradually be narrowed down and confined to those localities where conditions are most favorable, and all of the money invested outside of these areas will sooner or later be drawn within them.

These conditions then are divided into four classes:

1. Without irrigation and without rain.
2. Growth with irrigation.
3. Those portions of the country best suited to the growth.

4. The attempts that have been made to push it into localities that are not suitable.

Now tonight I will probably not have time to do more than show you the slides illustrating the lecture, so I will take time to say a few words here. A great deal of inquiry has been made with regard to the effect of our new possessions upon the sugar industry of this country. Letters are referred to me nearly every day by the Secretary of Agriculture, coming from persons all over the country, asking what will be the effect upon the sugar beet industry if this country acquires Porto Rico, Cuba and the Philippines. Our great tendency has been heretofore to import the greater part of our sugar supply because sugar has been offered to us so cheaply that it has been more economical to buy than it has been to raise it ourselves. And this iron rule will obtain in the future as it has in the past, for if sugar can be put down here cheaper than it can be made here, we will not raise it. So we must look forward before we can predicate the future. A few years ago the sugar made from sugar cane was greater than that manufactured from sugar beet. We thought of sugar almost exclusively as the product of sugar cane. At the present time, however, the amount of sugar made from the sugar beet is far larger than that made from sugar cane. The entire amount of sugar made and consumed in the world aggregated eight million tons, five million tons of which is made from the sugar beet, while from the sugar cane, the maple tree, the palm, etc., the remaining three million tons are manufactured. Thus we see the beet is the great sugar producing agent of the world. And then, too, what a wonderful influence has this industry had upon agriculture; and if it were to disappear today, the great service it has rendered to agriculture would far more than compensate for the trouble and expense of its promotion. You have doubtless heard of the establishment of training schools designed to train the young in the art of agriculture. Now, if you want the best training school in the world for the teaching of agriculture, grow beets and you will teach the people the highest principles to be learned in that respect. I have spent a great deal of time in looking at this question in its various phases as presented in other countries and the influence which this cultivation has had on other forms of agriculture. Fifty years ago in northern France the average yield of wheat was only 15 bushels to the acre, while now the average yield is 30 bushels to the acre, and that, too, because the art of beet growing has taught the people there the art of agriculture. This art is most highly developed when it increases the crop without perceptibly diminishing the fertilizer of the soil. So that if the cultivation of the sugar beet has never done anything else, it has at least advanced agriculture.

What I want to say is this: We have here a rapidly growing country. The time is not far distant when the United States will have a population of one hundred million souls, and it will make us the strongest nation in the world in touch with each other. Other nations, like Russia, etc., may have a larger number of persons nominally under one central government, but really consisting of scattered peoples and not in sympathy wtih each other or the central government. I say then the time is not far distant when we will see this country the most populous and most powerful nation in the world, for the power of a nation is in

its community and belief. Now, how does this fact have any connection with the sugar beet industry? In the first place we see that the consumption of sugar here is constantly increasing. I sometimes say in a jocular sense that if you will show me the food of a nation I will tell you that nation's place in the scale of civilization; I will tell you the rank of a country from what it eats. And as a nation is low down in the scale of progress, its consumption of sugar is also correspondingly low. Let me know how much sugar and soap a nation consumes, and let me see four or five of the women of that nation, and I will tell you just what that nation is.

If the amount of sugar is five or six pounds per capita, and the amount of soap is correspondingly small, and we find the women harnessed to the plow with a dog, I need not tell you where that nation ranks among the nations of the world.

Now, what are the facts here? This country is, with one exception, the greatest sugar consuming country in the world and that exception is a country whose people are closely akin to our own. England is the greatest sugar consuming country in the world, but her consumption of sugar, unlike our own, is not made in the direct use of the article, for England, as you know, is the great center for the manufacture of jellies, marmalades, etc., and in this way consumes a great deal of sugar in the manufacture of articles which are afterwards exported. Thus, while England consumes eighty thousand tons, we consume seventy-two thousand. Among all the nations of Europe we find that Italy and Spain consume the least sugar, the average there being about ten pounds to the person per annum.

One hundred years ago sugar was regarded as a luxury; today it is one of the necessities of the world. Sugar is excellent food, and if you have a hard job of work and wish to accomplish a great deal, don't take a bottle of whiskey with you; use that for convivial purposes and not for eating. Take a lump of sugar and you will soon feel the effects of its stimulating properties. If the weather is cold, don't use whiskey; that is not the time for alcohol. (Voice: "No time for it.") Put a lump of sugar in your pocket and in five minutes you will find yourself refreshed. The German army carry little hard-pressed lumps of sugar in their rations, for fatigue work, and the German army, which is always ready to take advantage of everything that is for its advancement, must do this because it is of benefit. As a stimulant in time of emergency you will find that it is something most excellent for that purpose. So, with all, there is a basis of reason in this great consumption of sugar as found in this country, which leads me to the conclusion, as stated above, that you can really measure the advancement of a nation by its sugar consumption.

And now to come back once more to the effect upon the sugar industry that our new possessions will have. We produce less than 300,000 tons of sugar. Now what will the possession of these few islands have to do with our prices. For twenty years we have received free of duty the sugar of the Hawaiian Islands. Under that treaty the product of the islands has grown from 150,000 tons to 400,000 tons, and it would grow still larger if it had more area in which to expand. But the area suitable to that production is practically taken up. But what do you think of a country that produces fourteen tons per acre?

Of course this is not an average crop, and if it were no country in the world could compete with it—the average is about seven tons to the acre, but I figure the entire output of these islands at 25,000,000 tons, and this amount coming into our country so far has made no impression, and so we fear nothing.

Porto Rico can never produce much sugar, and though all industries will undoubtedly thrive under American management, still two or three hundred thousand tons is all we may expect. Of the Philippines we know nothing, and although in the future we may expect something great, still we can count upon nothing sure at the present time.

Cuba, it is my opinion, will remain a foreign country for some time yet to come. So admitting all of these free of duty, we find that we still have millions of tons to provide for.

Now, the production of sugar is something more than a sentiment; no one is going to bend his back to thin sugar beets for fun, or unless there is some return for it. Admitting all these outside things, I am first for the United States under all conditions, but I sincerely believe there is a great future for us as regards the sugar industry; for with all I want to see this a prosperous country and want to see us manufacture everything we can at home. (Applause.) In all these years I have had the profoundest belief in America's ability to produce the sugar we consume. We have the soil and we have the brain, and, after all, the brain mixed with the soil is better than commercial fertilizer. (Applause.) From the present outlook we should all certainly be encouraged by the many evidences of progress. In Michigan you have made a great start, but do not give up, even if you have reverses, for with your facilities you are bound to triumph in the end. It is the industry which is founded on the solid basis which in the end becomes the progressive one. In the growth and manufacture of sugar we have an industry which cannot be overdone; we cannot produce the sugar we eat, and so we have got to get it out of our own sunshine and not pay foreign people for it. And this very fact, when it is thoroughly understood, I believe will be a great boon to our farmers. But in all this we must not forget that the soil has its rights as well as the citizen. The constitution of our country provides for the protection of the rights of its citizens, but it did not provide for the protection of the soil. The farming of the past hundred years has been a system of highway robbery. I am not a Michigander, but I was born in the state just south of here, and down there, as you have doubtless observed here, I have seen stables built out of rails, and when it became impossible for the horse to get in and out on account of the manure, the stable was moved to another place.

You talk about rotation of crops. A man in Arkansas was plowing. A teacher of agriculture in one of the leading schools was passing along and noticed that he plowed up and killed many snakes, and also that he was very careful to place these snakes in the furrow and plow them under again. "I am very glad," said the professor, "to see that you understand the true theory of fertilizing." "Yes," replied the farmer, "I believe in rotation of crops. I plow the snakes under and grow a crop of corn; from the corn we make whiskey, and from the whiskey we get the snakes again." There is one thing sure, however,

and one thing that I ask you to remember, and that is that you cannot grow sugar beets on the same land continually. You must have a rotation of crops. Don't exhaust the fertilizing property of your soil by the steady growth of beets.

Q. What are those elements that the beet takes from the soil?

A. Potash, nitrogen and phosphoric acid.

A few years ago the island of Cyprus was one of the richest spots of land in the world. Now it is a barren tract of soil, because the inhabitants raised wheat and nothing else, thereby selling the wealth of their soil to the peoples bordering the Mediterranean Sea. Ireland was once a fertile and great oats producing country, but its soil was ruined in the same way.

Q. What is the difference between beet and sugar cane?

A. There is no difference in its component parts, except that the beet sugar requires more trouble and care in eliminating impurities.

Q. Will you suggest a good rotation of crops for sugar beet raising?

A. I hardly know, only there should be some cereal grown in between. Clover is also good. Potatoes and beets are so near alike that I do not advise their use together. Indian corn and clover and one or two crops of clover harvested and the next plowed under would be a very good rotation.

The doctor concluded his remarks with a reference to the pure food laws and the part the farmer may take to secure their passage.

THURSDAY EVENING.

UNIVERSITY HALL.

President James B. Angell in the Chair.
Music by the University Mandolin Club.

FARMERS' ORGANIZATIONS—FARMERS' CLUBS.

HON. A. N. KIMMIS, MIDLAND, MICH.

In the preparation of what I shall present to you at this time, it was impossible for me not to be influenced by the knowledge that our meeting was to be held in this hall. I have no apology to make, indeed it is my hope that an appreciation of our environment shall be reflected in what I shall say to you. While this great University belongs to Michigan, and thus, in a sense, to us, I still like to feel that we are the guests of this great educational institution. No true son of Michigan but insists, and with justice insists, that this University is without an equal, certainly without a superior in all our land. Since our coming

here we have been living in an atmosphere so different from that which surrounds us in our ordinary business relations in the work-a-day world, that we seem to have been transported to some Utopia where the very atmosphere is pregnant with high ideals, lofty ambitions and ennobling impulses. With such surroundings sordid considerations seem out of place, and though the nature of my theme compels me in some measure to advert to them, it shall be my purpose to consider more at length that side of my subject which is more in harmony with our environment and present mental conditions.

At the outset it is my desire to enumerate some general propositions; they are not new, and the truth of them is so apparent that they will be accepted without argument. Their application to the subject may not at once be apparent, but will become so as we proceed.

As we look into the past and essay to judge concerning the wisdom of executed human conduct, we have only to be guided by the logic of events in order that we reach an accurate conclusion. It matters not whether we contemplate the acts of the individual or any aggregation of individuals, the conduct of states or nations, the result discloses the wisdom of the casual conduct. But no formula has yet been discovered, no method of reasoning devised by which human intelligence may determine with unfailing accuracy concerning the wisdom of executory or contemporary human action. The conduct of today, however seemingly well advised, must wait for the events of some tomorrow to conclusively demonstrate its wisdom.

Something desired is the mainspring of all voluntary action, and the act is deemed expedient and wise if it conducts to the desired end.

Given an end to be attained, it is the province of wisdom to determine what is best suited to its accomplishment.

That man is most wise who can with greatest accuracy foretell the result that will follow upon contemplated action.

Accuracy of conclusion is always dependent upon a broad and intimate knowledge of the nature of the subject considered and of the relation and correlation of all the forces bearing upon it.

Let us keep in mind these observations and their application to the subject as we talk about Farmers' Organizations.

Organization—or the combining of units into a whole which shall possess the attributes of an entity—must always proceed in harmony with laws not always clearly defined, but immutable. But where the unit of the organization is possessed of freedom of choice, and can become a constituent part of the organization only by being willing to do so, and can of its own free will withdraw from the organization, a peculiar condition exists which is controlled by peculiar laws.

We have noted that all voluntary action is an effort toward the accomplishment of some desired result. The individual becomes a member of the organization only when he is satisfied that the organization is a means well adapted to the securing of something which he desires. It is evident then that the cohesive force of organization composed of members having freedom of choice, must be the hope of accomplishing, by means of the organization, something which is desired by each of the members. If faith wanes as to the ability of the organization to accomplish the desired results, the organization disintegrates. If the aim ceases to be desired, the membership falls off. If the object be accomplished, the organization ceases to exist.

There have been many organizations of farmers; many of them have been unsuccessful. It is not our purpose to speak concerning the causes of failure further than to observe that they may all be found in a failure to understand and appreciate the force of laws which were applicable to the particular case. It is our purpose and happy privilege to speak concerning an organization that has proved and is proving successful, to examine its foundations and superstructure, to note its bulwarks, fearlessly point out weaknesses if we shall discover any, and finally to hazard a prophecy concerning it.

The Farmers' Club finds its energizing principle in the almost universal desire for progress; it finds its cohesive force in that it appeals to human reason as being well adapted to secure the ends sought; its aim is progress. The preamble to the constitution of the State organization announces its purpose to be "the advancement of the social, moral, intellectual and financial condition of farmers."

I am confident that the framers of that constitution did not mean to indicate the relative importance of these objects by the order in which they are placed, but whether intentionally so or not, they have placed them very nearly in the order of their accomplishment.

Social, moral, intellectual, financial progress. Each of these results is an object of desire to every well balanced individual. The measure of desire attaching to each will vary in different individuals, their relative importance will not be the same in the minds of different persons, but the Farmers' Clubs have conformed to that law which decrees that the results sought must be desired, and must be the subject of continuing desire on the part of the membership if the organization shall endure. Having found a compliance with this fundamental law, we are brought logically to a consideration of the method of organization and methods of work.

It seems hardly necessary to speak to an audience of this character concerning the methods of organization and work of Farmers' Clubs. The Farmers' Club is open. It desires all people of every class to know its purposes and methods, to the end that it may profit by intelligent criticism. Intelligent criticism is valuable, but intelligent criticism must always be based upon a thorough knowledge of the thing criticised.

The evolution of the Farmers' Club movement has been in accordance with natural law, from the particular to the general, from the less to the greater.

I am not informed which Farmers' Club may claim the honor of being the oldest, nor do I know when it was organized. The ambition of the local club is not to establish its antiquity, but to demonstrate its power, and power is not measured by length of days, nor numerically. Some of the smaller clubs, when measured by the power of their influence, are the peers of some numerically many times larger.

Of this, however, I am certain: the first Farmers' Club was born of a desire in the hearts of those who promoted it, for progress along social, moral and intellectual lines.

Thoughtful men and women as they must have been, they were doubtless uncertain as to the result of their undertaking. They, basing their deductions upon their knowledge of the general laws of progress and upon their knowledge of man's social, moral and intellectual nature, concluded that they were adopting methods well calculated to secure the

desired results. We judge of their conduct in the light of events and with certainty affirm its wisdom and beneficence.

I have said that the logic of events leads to accurate conclusions. The statement implies an ability to comprehend events. While we may be able to determine as to the tendency of events, we are sometimes wholly unable to determine the extent of their influence. This is usually true concerning those influences which operate on man's higher nature. Who shall determine the influence of a righteous act? Even a generous impulse or a noble resolution is beyond human comprehension in the power of its influence. We affirm what we do know when we assert that the methods of Farmers' Club work are such as to be the parent of generous impulses and noble resolutions, of which in turn is born lofty conduct.

For many years in many places the Farmers' Club was unostentatiously, but powerfully, acting upon the social, moral and intellectual status of the community where it existed. Go into one of those communities and carefully note its moral tone; determine as accurately as you may the intellectual calibre of its citizens; learn of their social instincts and tendencies; then compare these conditions with those existing in some other community similarly situated, except that it has lacked the influence of the Farmers' Club.

These comparisons are frequently made and always force the conclusion that the Farmers' Club is a powerful influence for the uplifting of a community, socially, morally and intellectually. But until man shall be able to compass infinity, or until we are ready to admit that man's moral and intellectual condition here shall have no bearing upon his condition in the Great Beyond, let no man attempt to measure that influence in its height and length and breadth.

But you ask, does not the Farmers' Club assist in bettering the farmers' financial condition? Yes, as a result—an almost inevitable result—of advanced social, moral and intellectual status.

As an ultimate purpose the amassing of wealth is unworthy of man's best effort. It is not my purpose to enter upon a discussion of either the practical or ethical influence of wealth accumulating, but I do wish to affirm, and with emphasis, that financial progress is not, and never has been, the chief aim of Farmers' Club effort. In most clubs it has been properly subordinated to its right position, namely a resultant good to be realized as an incident in the accomplishment of something infinitely better. That individual, and it applies to organizations as well, whose main purpose and desire is the amassing of wealth, will, if he succeeds, find himself dwarfed in all that constitutes noblest manhood, while the chances are that he will be defeated in his main purpose, for "there is that scattereth and yet increaseth; and there is that withholdeth more than is meet, but it tendeth to poverty."

Do not misunderstand me. As means to an end, wealth is desirable. Poverty is always a misfortune, a hindrance, a limitation. Wealth places within our reach the materials which aid so powerfully in the development of our higher natures. It gives us our homes with their ennobling influences. It fills our parlors with music with its refining and purifying power. It adorns our walls with the works of the masters, and our appreciation and love of the beautiful is developed and intensified. It fills the shelves of our library with the works of the best authors. It enables us to compass the earth and the wonders and

beauties of nature are spread before us. All wonderful helps to the development of all that is best and most desirable in human character. Needful and helpful as money is, it may yet be acquired at too great a price. Long pursuit of wealth as the chief aim of life will deprive man of the ability to properly use wealth when acquired. Well known truths you say? Yes, but of such tremendous import that their repetition is justified.

The proud boast of the local Farmers' Club is that its aim has always been free from sordid considerations, and while it aids in the gaining of money it teaches its noblest uses and enlightens the possessor of wealth in its ministrations to the end that it shall assist in procuring that which is of real and permanent value.

A growing missionary spirit, a desire that the good enjoyed shall be extended to others, is a sure sign that there is growth in the best attributes of human character. Such a tendency was exhibited in the formation of the State Association of Farmers' Clubs. The preamble of the State Association declares as one of the purposes of the local clubs in forming the central organization, "to stimulate the formation of other clubs" in order that the benefits which they enjoyed might be extended to other communities. From the time of the organization of the State Association the growth of the Farmers' Club movement has been marvelous. Statistics of the organization prove the wonderful numerical development, but afford no index to the development of its power which seems to have been advancing in a geometrical progression.

The fundamental causes for these marked results, as has been shown, are found in the purposes and methods of the organization. But a further very potent contributing factor is the energy of a vigorous class of men which was thoroughly enlisted in the cause. The Farmers' Clubs bear united testimony to the efficiency of the department of the Michigan Farmer devoted to their interests, and no enumeration of the forces contributing to the success of the Farmers' Club movement is complete without particular reference to the man who has so successfully and fearlessly conducted that department—Hon. A. C. Bird, our present Secretary of the State Board of Agriculture—who in his present position, as in all former positions, has demonstrated his ability to bring things to pass. While we regret his retirement from the position of editor of our department in the Michigan Farmer, we are gratified that Hon. I. Roy Waterbury, a gentleman in whom the Clubs have great confidence, is to succeed him.

If we consider the matters which have engaged the attention of the central or State organization, we shall find that it has been inspired by the same lofty purposes which have characterized the local clubs. In all its history it has never declared in favor of a selfish purpose. It has never asked that an advantage be given it or to the class which it represents. It is the proud distinction of the Farmers' Club that it has never sought the accomplishment of a purpose which would not have bestowed benefits upon every class equal to those which would have inured to farmers. It has advocated and has aided in bringing about changes which have resulted in direct cash saving to the people of Michigan, but back of it all was a principle which was of greater importance than financial considerations. (The speaker here cited several reforms advocated by the Farmers' Club in proof of the foregoing statement.)

That there has always been something broader and better than financial considerations which has inspired the work of the Clubs is proved by the fact that the work has been carried on almost without money. The time and the energy of the workers has been devoted freely. There have been no salaries or other emoluments of office to lure the workers on. Devotion to the cause, a sincere desire to aid in the accomplishment of noble purposes, has been their inspiration.

Young in years, but old in hereditary and acquired experience; broad in purpose, but converging its forces in a manner to be effective; poor financially—it has practically nothing—yet rich in energy, nobility of purpose and all that goes to make real power. Such in brief is the Farmers' Club today.

What of the future? Will the Farmers' Club endure? Can we discover forces that are tending to destroy it? It is singularly free from disrupting forces. I know of no internal dissensions in the local or general body which can be regarded with even the slightest alarm. Inherent weaknesses in the organization, if there are any, have not yet revealed themselves.

The organization is philanthropic, therefore it is singularly free from aggressive forces from without. It is philanthropic in that its purposes, if accomplished, would benefit all classes. Its aims are constructive, not destructive. But in the construction of good things it sometimes becomes necessary to remove obstructions. Right and wrong must ever stand opposed. Truth and error cannot occupy the same place, and in its efforts to advance truth and right, the Farmers' Club will always meet opposition. That opposition has been met, it came and will always come from a class of men who are profiting, or hope to profit, by the continuation of error and wrong. Such opposition is helpful and a real compliment. The Farmers' Club has always received unqualified endorsement from the best citizenship without regard to class. Destructive forces then, so far as we can discover, either within or without the organization, are non-existent—at least do not exist in degree to cause apprehension.

So long as the Farmers' Club holds to its present line of effort and methods, this happy condition will continue.

Will the purposes and aims of the Farmers' Club ever cease to be desired by its members and the organization disintegrate? Not until evolution shall be superseded by revolution, and man willingly enters upon a course of retrogression.

Will its purposes be fully accomplished so that there be no need of further effort? Not until man has reached a position so exalted that there can be no further progress, which is absolutely inconceivable.

Under these conditions, who shall venture to number the days of the Farmers' Club's existence?

What will be the specific line of endeavor in the future? The local Clubs will continue the work in which they are now engaged and will pursue improved methods as experience shall demonstrate to be wise. By frequent and regular meetings social conditions will be advanced. By discussion of questions bearing upon our civil condition knowledge will be acquired and intellectual grasp broadened and strengthened. By considerations of questions pertaining exclusively to farming, improved business methods will be discovered and adopted. A larger

measure of prosperity will result, while progress in these lines must inevitably result in moral exaltation. This is peculiarly the field of the local Farmers' Club.

The State Association of Farmers' Clubs derives its strength from the local Clubs. It is but an instrument for the execution of the collective will of the local Club. Commensurate with the growth of local Clubs will be the growth of power in the State Association.

The lines of effort of the State Association will be determined by the sentiments engendered by local Club work.

Judging the future by the past, it will be the province of the State Association to interfere in public affairs to the end that their administration may be in harmony with a loftier conception of official duty.

Today we are confronted with a lamentable state of affairs in public life. Yet we look hopefully to the future. If the Farmers' Club, local and State, shall rise to an appreciation of their duties and opportunities, fearlessly facing the situation, exerting their power in accordance with their declared principles, the time is not far distant when it will be impossible for men to be exalted to official position who, false to every tradition of manhood, shall betray the trust, and cause our fair State, traduced and disgraced, to be almost a stench in the nostrils of all lovers of good government, and every loyal citizen to be bowed with shame. Will the Farmers' Club rise to the opportunity?

All human history is but the record of a conflict of ideas. It is the "trial by battle" wherein the false must ultimately be destroyed and truth come forth triumphant, fit material for the building of the temple of human progress.

In this contest of ideas the Farmers' Club finds grandest opportunities.

If the Farmers' Club holds steadfastly to its avowed purposes, its motto may be changed. Let it be written like this:

"The purpose of the Farmers' Club is to make the world better."

And to make the world better means that individual and generic man shall be continually advancing toward that sublime ideal, that exalted position which it was intended he should occupy, and to which the evolution of the ages, unfolding ever in beautiful harmony with the Divine plan, will ultimately bring him.

THE FARMER AS A BUSINESS MAN.

HON. A. C. BIRD, AGRICULTURAL COLLEGE.

The wisest poet philosopher of his age has said, "It is easier to teach twenty what were good to be done than to be one of the twenty to follow your own teaching." One may well remember the implied criticism in these words ere he presumes to speak upon this subject.

There is a prevalent antipathy among farmers against a theoretical address upon a purely business subject. It is to them, and I will confess that I share in the feeling, one of the astonishing and inexplicable phenomena of human life that so many men engaged in other vocations than farming seem possessed with the innate belief that they were born

to give advice to farmers; that if they only had the time and opportunity they could show almost any farmer how to conduct his business more successfully than he is conducting it himself. It is one of Heaven's kindest acts of clemency that not more of these good and kindly disposed people are given the opportunity to relieve themselves of their amusing conceit.

Of this thing I am certain, that no man who has not lived as farmers live; no man who has not thought as farmers think, felt as farmers feel, met and faced and solved the same difficulties that farmers are continually and persistently being compelled to meet and face and solve, has any conception of what it means to be a successful business farmer. In other words, that no man who has not been through it all himself has any right to map out a course for others to follow.

If any of you question this position or would accuse me of narrowness in this view, permit me to ask what you would think if, in a convention of merchants, called for the purpose of considering mercantile affairs, a farmer, who had never had any experience in mercantile life, were to presume to give advice along mercantile lines; or if, in a convention of doctors or lawyers or manufacturers, a farmer, whose entire life had been foreign to such vocations, were to volubly dilate upon the precise manner in which men engaged in these professions or enterprises might work out a success.

Do not misunderstand me; I am not belittling the value of intelligent criticism, neither am I questioning for a moment the entire propriety of men of different vocations calling the attention of their friends in other vocations to mistakes they are making, to their lending the helping hand of good advice at any and every opportunity where it will be well received and result in good. There is a great law of the universe that makes every vocation a part of every other vocation. Under that law every successful banker owes occasional kindly business criticism to his true farmer friend. He owes it likewise to his true lawyer friend, his true doctor friend, his true mercantile friend. Each in turn may well help the others from the special fund of experience which he has in store. And I am not mistaken when I say that there are hundreds and thousands of successful farmers who are well qualified to contribute to this common store. But against the idea that the farmers' business is so simple and so easily understood that every man is competent to give him wholesale advice I would enter an emphatic and everlasting protest.

I know of no other line of business in which the field is so broad or so intricate, in which there are so many difficulties to overcome, in which knowledge of so diversified a character and so exact in detail is required, in which close attention and immediate personal supervision are so essential as in that of successful farming. The successful farmer must be an expert judge of the many different kinds of soils. He must know not only the value of those soils but the different crops to which they are adapted, the fertilizers which they need, the proper time to cultivate them and the proper time not to cultivate them. A single stirring of that soil when too wet may destroy the profit of a season's work and deplete the value of the soil for years to come. He must be familiar with the nature of every crop he grows. If successful he must know the laws of growth and the laws of fruitage of every crop he grows upon his farm. He must know the time to sow, the time to till and the time to reap, and for every crop this is a different problem. I have repeatedly

seen farmers lose enough to pay their entire tax levy for the year by delaying the beginning of wheat harvest for a single day after the crop was ready for the binder. I have seen more often still a greater amount lost by not having the work so planned that cultivation could begin at the proper time. The variation of a single day in the time one begins to cultivate the corn crop, or any of the crops demanding clean cultivation, not infrequently means that it will afterwards take three days to perform what one day would have accomplished if done at the proper time. With the hundred different irons in the fire which every successful farmer continually has, I want to say that he who so plans his work that all are taken care of at the proper time, is a general of no mean order. And yet such a man must the successful farmer be.

But he must be vastly more than this. He must be a trained judge of every kind of stock upon his farm. He must know the laws of their development. He must know the value of the diverse feeds and the proper time to use and not to use. He must know the breeds and the individuals of those breeds, the foods and the conditions whereby he can produce a pound of beef, mutton, pork, milk, butter, wool, at the greatest profit, and it is a different problem in every case, a different problem with every kind of stock, a different problem with every breed, a different problem with every variation in the price of feeds, a different problem with every variation in the market price of the product created, a problem differing with every one of the almost innumerable changing conditions with which the breeder and the feeder are continually surrounded.

The successful farmer must be a good salesman. He must be a student of markets. He cannot raise all the stock he wishes to feed, hence he must be a good purchaser. He must be a good judge of human nature or he cannot do these things. He must look farther into the future than any other business man for the returns from his investments are generally long delayed. He must be a successful manager of hired labor, one of the most difficult problems with which a farmer has to contend. When you remember that the average farm laborer is an irresponsible sort of person, that he is with one man one year and with another man the next, in one community one year and in another community the next, that his whole training has been such as to make him careless of his employer's interests, at times at least, and yet that you must trust him in the most responsible of positions, that by a single act of carelessness or error in judgment in watering or feeding he can spoil your best team, that he can turn the profit of a winter's feeding into a loss by one or two mistakes with your flock of fattening lambs, that by leaving you suddenly at a busy season of the year he can occasion you more loss than his whole year's wages would amount to, when you remember all these things you will understand the discouraging sigh which emanates from so many good farmers when the hired help question is introduced. Many and many other qualifications might be enumerated did time suffice, failure, or even weakness, in any one of which would be fatal to the success of a farmer as a business man.

And yet hundreds of farmers in every agricultural county in this State are successfully meeting and overcoming all these difficulties. Shall we deny them the right to be called business men? Can you point out to me any line of business more intricate, any line of business which will

furnish employment for more intellect or for intellect of any higher order? There isn't a more commonly or a more grievously mistaken notion than that farmers are not so good business men as the followers of other vocations. Let me give you an illustration:

It befell me to spend three years of my early life as assistant cashier of a bank in a village of this State containing 3,500 inhabitants. It was an essential part of my duties to acquaint myself with the business history of that town, with the business history of every man doing business in that town and in the surrounding community. I well remember my great surprise in learning that of all of those who had been engaged in mercantile or manufacturing pursuits in that village for the previous twenty-five years, only 9 per cent had escaped making an assignment, only 5 per cent could properly be termed fairly successful from a business point of view, only 2 per cent could be classed among the decidedly successful, and exactly one-half of 1 per cent had attained sufficient success to attract the attention of the outside world. Turning to the country, for our business was largely with the country people, I found results ten-fold better than in the village; indeed, I found that of all the wealth represented in the village at that time, 90 per cent of it had been brought to it from these self same farmers and their predecessors, and had been made upon those self same farms.

Only a few years ago, being about to make some investments in a city of 6,000 inhabitants in Southern Michigan, I made similar investigations with practically the same results. My experience has taught me that those conditions were the ordinary, and their counterpart can be found in almost every village and small city in the State.

My friends, this great wave of discontent that has sometimes threatened to engulf our agricultural homes, and which has been responsible for the sweeping of hundreds and thousands of our most ambitious young men and young women from the farms for which they were fitted to the cities for which they had had no training, is all an illusion; an illusion caused by our fixing our eyes on the one-half of the 1 per cent who have won in the cities, and foolishly closing our eyes to the 99½ per cent who did not win. It is a fact, and for thirty years has been a fact, that the opportunities for reasonable business success are ten-fold greater upon the farm than in any other vocation under the canopy of Heaven.

Then shall we conclude that farmers are such good business men that we have nothing to urge upon their attention along the line of better business management? If you so think, go with me, one week, two weeks, three weeks, and all too often even months after the harvest is completed, and see the hundred dollar binder still standing, unhoused, exposed to sun, wind and rain. See the plows, cultivators, harrows, mowers and hay rakes in the fence corners or unsheltered in the barnyard. See the gates hanging on one hinge, causing enough loss of time each day to repair the damage for a decade to come. See the many things lying around unprotected, going to ruin faster than when they are in active use. It is not putting a word too strongly when it is stated that enough money is wasted each year by the careless use of farm machinery and failure to properly protect it when not in use, to pay one-half the interest of the farm mortgage indebtedness of the State.

These are matters easily corrected, and it is difficult to explain why so

many farmers waste their substance in such simple ways. The power of habit, however, is not easily overcome, and he who has become wedded to slovenliness or carelessness along any of these lines will find that he has fetters of steel to break before he overcomes these failings.

The one business fault of all others among farmers the most common, and the one over which I have many and many a time unavailingly pondered, is their carelessness in keeping business engagements. It is the besetting sin of farmers as a class. My dealings as a loan agent with the farmers of the southern five tiers of counties of Michigan have been quite extensive for the past fifteen years. My loan business has been confined almost exclusively to farm mortgages. I have taken my pick of loans, preferring absolute security to high rates of interest. I have dealt with the best class of farmers I could find in Southern Michigan, and I know whereof I speak when I say that not one farmer in one hundred knows the value of never allowing the payment of principal or interest to lapse a single day without making previous satisfactory arrangements with the man with whom he is dealing. Well can any man afford to spend a whole day, if need be, rather than allow a payment to become past due without a previous satisfactory explanation. That lesson farmers as a class have not learned, and what is the result? That the average rate of interest on farm mortgages in Southern Michigan today is six per cent. Farm mortgages are supposed to be as good security as any in the world, and I believe them to be so myself. Yet money has gone begging in the cities for years at four per cent on security not so good, or at least not a whit better, while the average rate on farm mortgages has remained at six per cent. The savings banks of the City of Detroit, with all their millions of dollars of capital and deposits seeking investments, will not touch farm mortgages. Why? Solely for the reason I have stated, that farmers cannot be relied upon for ordinary business promptness. Correct this evil practice and I promise you, and I state the words deliberately, that the average farm mortgage interest rates in Southern Michigan will fall from six to four and one-half per cent, or lower. Isn't it worth the trying? The farmers of Michigan complain of the high State tax of Michigan, and I don't blame them for it; I complain myself. But if the farmers of Michigan were to correct this one bad business habit they would save in interest alone enough every year to pay their entire State tax.

I have been asked, Should a farmer voluntarily go in debt? If you are a good business farmer and need more money than you have of your own, as nine out of ten young farmers do, by all means do not hesitate to go into debt, providing your business judgment approves your enterprise. Ninety per cent of the best business men in the world are in debt more or less all the time. But guard your credit as sacredly as a good woman guards her good name. Good credit is the best capital stock a good business man can have, especially if he be a young man, but credit to be good can never be trifled with.

Don't run store accounts or any other kind of accounts. There is a vast deal of business sense in the paradox, Pay as you go if you have to borrow money to do it. Borrow money at the bank or of your friends if necessary, and pay for the accommodation, but don't run accounts. The advantages gained in the long run will pay the interest at the bank twice over.

Keep some system of accounts. Make it simple. If you don't it will

be a failure. Don't try to keep an account with every field or with every crop. Not one in a hundred will bear up under such a system for a twelve month, and I doubt the value of the figures after they are recorded. The only man I ever knew who did that sort of thing used to publish his results in the agricultural papers, and he always managed to figure out a handsome profit on every crop his farm produced and on each kind of stock he kept upon his farm. I knew the man well and I know he thought he was honest in his statements. But all these years he ran behind from five to fifteen hundred dollars every year and he spent the last years of his life a tenant on the four-hundred acre farm he once owned free from incumbrance. A well kept cash account, giving items and dates, with occasional memoranda, will afford the data necessary for future reference and posting at leisure. It will afford a complete record of the farm receipts and disbursements and sufficient collateral facts to give you, with little work or trouble, almost any data you may desire.

Make an inventory every year at the same time of the year. Make it carefully. It is just as essential in farming as in any other lines of business. Whether the results of the year's work have been favorable or otherwise the facts should be known. The task is not a long one and it will afford you great satisfaction in the years to come.

And, last of all, the farmer as a business man cannot afford to hoard the money which he makes. He owes it to his family, to society, to the business world of which he is a part, he owes it to himself, to use that money so that it will do the most good to his family and to society. Even from a strictly business point of view he cannot afford to do otherwise. A home full of dollars is not of necessity a home worthy of the name, and he who thinks otherwise is poor indeed. Even in the early years, when the debts look large and the future is not clear, no man can afford to starve his better nature nor to dwarf the lives of those about his fireside. The debts will be paid just as fast, and I think a little faster, if we afford ourselves the pleasures, the recreations and the food that both mind and body crave. A good constitution, an elastic spirit and a healthy mind are all essentials to success. The man who dwarfs either or all of these may win, but in the winning he will lose.

It is the one thing in the institution with which I am now connected of which I am most proud, that we are fitting young men and young women for business success in life, for business success upon the farm, for the building up and maintenance of farm homes and farm life upon a higher level. The trend of college education is so often away from practical things, away from the practical affairs of life. The most pathetic thing connected with the higher education of the past is the great number of graduates which have been turned out into a practical world with no practical training with which to face that world. Let us guard the future against the mistakes of the past. Let us teach the gospel of practical things, the gospel of business success, the gospel of money making if you choose to call it such. But let us not forget to combine with it the gospel of judicious money spending. Let us teach business habits and business methods, teach them on our farms, teach them in our homes, teach them in our clubs and in our granges, teach them in our schools, yes, teach them in our colleges and even in our great universities, and, my friends, the world will be the better, infinitely the better, because of this teaching.

THE FARMER AS A CITIZEN.

HON. CYRUS G. LUCE, COLDWATER.

The next address was by ex-Governor Luce of Coldwater, on the "Farmer as a Citizen." He spoke without notes and made a very effective and interesting address. His remarks were as follows:

"It is a great office to be an American citizen. No other nation imposes such privileges upon a citizen. These educators who have spoken have been properly and royally loyal. And so I want to be. If any man thinks I exalt the farmer too high he should remember that I am a representative of the farmers.

"Governments have been in existence before today. The first was the family government. Adam didn't set that up as soon as he should have and didn't train his children right. But it was the first. Since then governments have come down in rapid succession. Some rulers drew their power from God by divine right. Military chieftains have gone forth and won victories over their enemies and returned home to set up governments to glorify them. But our fathers set up different government. It stirs my heart with pride when I think of the struggles they underwent to establish this. Every American wears a crown brighter than that of the Czar of all the Russias. No other nation has reached the heights in conferring power on the citizen as has the United States. None has been quite so broad or relied so much on the patriotism of its citizens.

"What peculiar duties has the farmer as a citizen? In what does he discharge his duties?

"Two qualifications of the good citizen are mentioned in the great ordinance of 1787, religion and morality, and education. I maintain there are three essential qualifications of the good citizen. The first is morality, i. e., virtue, justice, integrity. The next is ability. This ability to discharge one's duty is obtained in various ways and comes from various sources. Another equal to these is religion. Perhaps this should overshadow them all, but I place them equal. The last one, and one as important as the rest, is industry.

"I place great stress on industry. Work is the salvation of the family, of the locality, and of the nation. How could Prof. Smith have made this Institute such a success, unless he were a mighty worker? Work comes in as one of the leading qualities of a millionaire. I have always regarded Webster as the greatest man America has ever produced. What would Daniel Webster have amounted to without work? At six months of age he was as any other man of the same age. He was able to take care of himself by supplying himself with the necessaries of life. And he applied this occupation with such persistency and energy that he attained great success. Another great man was Abraham Lincoln. Added to his ability were work and unflagging industry. No citizen who is lazy is discharging his duty to the state. I have always been a terrific worker and if I can make any claims it is to industry. The farmer must work or starve. A lazy farmer may roll around and get along. And his friends will bury him when he dies. But don't call

him a farmer. People often have such a man as a representative of farmers and make fun of him. I could scarcely call him a citizen. We are compelled to work by our surrounding circumstances. To be good citizens we must work. Honesty, fidelity and a truthful discharge of all our duties, both private and public, are absolute requisites to good citizenship.

"The President has said I had addressed more farmers than any other man in Michigan. I believe I have. But I have also addressed others. I have often addressed ministers in conventions. I have always advised them to preach shorter sermons. And I believe I may have had some influence, because they certainly do preach shorter sermons than they formerly did. I have often spoken to lawyers, too. I have advised and admonished them repeatedly never to defend a man they knew to be guilty. But I could not have exerted any influence there, as they all do it yet.

"Go on and be honest, holding your integrity. You owe it to your country and your posterity. I heartily endorse what Dr. Wiley said this afternoon. The farmer who wears out his soil is a sinner. He commits a crime against himself, his country and millions yet unborn. We are bound to conduct our farms so as not to wear them out. We are going in this direction now.

"In comparing the farmer as a citizen with others, I have no wish to pluck laurels from the brow of any man. But on the whole the average farmer is more honest than other men. This is no particular credit, however, as he does not have to face the temptations that confront men in cities. He lives in communion with nature's law, which teaches honesty, integrity, and all other high and noble ideals. We have some disadvantages. We are in a way dragged down by our surroundings, but as a rule maintain a higher standard of morality than the average. People in towns don't live as close with their families as does the farmer. I was called on a coroner's jury to investigate the suicide of a nineteen-year-old girl. Her father said he got up at six, took an early breakfast and went to work—before the girls got up. When he returned he was tired, the family had eaten, perhaps the girls were not at home and he did not see them before he went to bed. He said, 'I'm very little acquainted with my family.' That lesson has grown with me constantly for forty years, and I'll thank God I live on a farm and spend my time with my wife and children, and keep up that close communion that leads to the highest life. Michigan has twenty State institutions and I have visited all except the last ones built. Six are educational, purely, and three both educational and charitable. Farmers were always well represented except at two. These were reform schools. They never had over three per cent of farmers and usually only about two. They are just as bad by nature, but don't have the opportunity for doing wrong. Our great-hearted philanthropists and large-souled statesmen have constantly worried how to govern the cities until this problem was overshadowed by our war with Spain and later with the body across the Pacific. But did you ever hear of anybody worrying how to govern the people in the country? They govern themselves. We are at peace and harmony with each other. Perhaps this is partly due to the Farmers' Clubs and the Granges.

"Prof. Bailey made a mistake when he said the farmers never brought

about any of the educational reforms except the extension movement. I was in the legislature in 1855 when the Agricultural College was established, and the farmers were back of the movement. The farmers also were most influential in making the head of the agricultural department a member of the cabinet. We were back of it and wanted an opportunity to grow. We are on good terms with the University and Normal. These institutes are university extension courses in agriculture.

"The citizen must be prepared to fight for his country at any time. No men were ever better soldiers than the farmers. They have always had strong arms and brave hearts for the defense. If you doubt it, go to Lexington, where the shot was fired that is still heard around the world. If you still doubt, behold the few thousand sturdy farmers in South Africa who held at bay the British Empire."

THE MANUFACTURE OF SUGAR FROM BEETS.

DR. H. W. WILEY, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

This lecture was illustrated profusely with a stereopticon. Beginning with the construction of the factory, Dr. Wiley carried the audience through the factory in operation from the slicing of the beets to the sale of the sugar. The lecture was intensely interesting, and notwithstanding the lateness of the hour at which it was delivered was listened to with the closest attention.

FRIDAY FORENOON.

NEWBERRY HALL.

TOPIC—LIVE STOCK CONTINUED.

Wm. Campbell in the Chair.

THE BACON HOG.

J. J. FERGUSON, B. S., AGRICULTURAL COLLEGE.

In discussing a few of the more important features in connection with the business of up-to-date bacon production with you this morning, you will be careful to bear in mind that my presentment of the case is made from the point of view of those engaged in the business in the adjoining Province of Ontario. Across the line, the producers have for several years been working towards the production of that class of pork products which shall to the greatest possible extent meet the

requirements of the consuming centers of Great Britain. In these central and middle western states, tributary to the packing centers of Chicago, where the trade demands products widely different in character from those which are at a premium in Canadian markets, it seems to me that it would be wisdom on the part of the farmer to move slowly in the matter of introducing modern-type bacon hogs. Over here, we have not yet reached that stage in the business where this type of hog commands a premium. As a matter of fact, in some of the large American markets thick fat hogs are bought more readily than those of the other type. In Canadian markets there is a discrimination in favor of bacon hogs of twenty-five to seventy-five cents per hundred, live weight. Under these conditions, the farmers have merely been following a good business policy in producing the hog most in demand. Just as soon as the home and foreign trade of the American packers will justify their following a similar course, so soon will there be profit for our farmers in investing in special purpose bacon hogs.

Hence, at this time, I do not come before you to urge upon you any advantages likely to follow the introduction of this type, but merely to submit for your consideration the methods which have been followed by Canadian farmers and which have resulted not only in large profit to themselves, but in placing Canadian bacon products in close competition with the best brands of Danish and Irish going forward to British markets. Bacon pigs are born, not made.

THE KIND OF HOG WANTED.

General Characteristics.—The great object in producing bacon pigs is to secure animals possessing a large proportion of lean, muscular meat. While they should not be fat, neither should they approach the extreme of being poor. A good bacon hog has a light head and light framework generally. He has a light shoulder and a fairly heavy ham (average weight, 18 to 20 pounds), the side should be as long and as deep as possible, the belly wide and thick, the back should be thinly fleshed, with the fat running in an even layer, an inch to an inch and a half in thickness, from in front of shoulder to tail-head. There should be no tendency toward a heavy patch of fat on top of neck. The following shows the severity of the grading done in England: "The sides have to be measured, then weighed and classified as to fatness, so that the sides in each box will be within two inches of the same length, the same thickness of fat, and there must not be a difference of over two pounds between the lightest and heaviest side in a box." This simply means that the packer, to save himself, and protect the man who furnishes the right type of pigs, must "cut" severely on all animals which will not grade No. 1.

Weight.—A bacon pig should come between the limit of 160 to 220 pounds, live weight; animals above or below these weights must go into a second grade. One of our packers informed me that he wanted pigs that would give him bacon sides of 90 pounds. The large fat hog of 300 to 450 pounds is simply not to be considered for the bacon trade, and further, these lighter hogs bring a much larger net return pound for pound. In the first place, they sell for 25 to 75 cents more per hundredweight, live weight, than do the heavy fat hogs. Even within the limits of the English bacon weights there is frequently a difference of as

much as ten shillings per 112 pounds between "lean sizeable" and sides but little heavier, and further, it costs less to make a pound of pork with a young animal of two hundred pounds or under than with an animal above that weight. This past season an experiment was conducted at our Guelph Experiment Farm which very clearly demonstrates this. There were thirty-six hogs, fed on a mixed meal ration. The following figures are the averages representing the number of pounds of meal required per pound of gain during different periods:

Live weights.	Pounds of meal per pound of grain.
54–82	3.10
82–115	3.75
115–148	4.38
148–170	4.55

Within even these short limits, the increase in cost is 50 per cent; it is relatively greater after the weights at which this experiment terminated.

Age.—The packer does not want the bacon pig forced to a weight of say 200 pounds at five and a half or six months, as might easily be done. This "baby" bacon has not a proper development of firm, muscular meat; it is the "veal" of the bacon business. At least a portion of the "soft" sides come from immature pigs. The packer wants the animals so fed as to reach the proper weight at seven or eight months.

It is interesting to note the comparison of shrinkage percentages in the different classes and weights of swine. The following figures will be found approximately correct:

American (corn fed)	23 per cent.
Heavy thick fat hogs over 400 pounds	16–18 per cent.
Choice singers (160–225 pounds live weight)	23 per cent.
Light "under-sized" (125–160)	26–28 per cent.

In sections of country from which a factory draws its supply, the live and dead weight prices practically balance each other.

Those qualified to express an opinion on this matter agree that no breed or breeds have a monopoly in the production of first-class bacon hogs. But this much we know, that there are some breeds which yield a larger proportion of them than do others. There are some breeds which have been bred for generations with the definite object of developing certain characteristics which must be discounted in the bacon business. In the course of time, there might be obtained from these, by careful selection and perpetuation of strains inclining towards the bacon type, animals which would suit the requirements of the business. This process of evolution is, however, too slow and expensive for the average farmer. The breeds from which are obtained probably the largest proportion of choice singers are the Tamworths, the Improved Yorkshire, and the Large English Berkshire. The cross-breds and various grades of these breeds are also usually quite satisfactory. The Essex and Suffolk strains are entirely unsuited for the business. For other breeds, as the Duroc Jersey, Poland China, Chester White, and the old-time Thick Berkshire, while we may occasionally find fairly good bacon pigs among them, we do not look for them. This does not mean, however, that all these breeds should be made to conform as soon as may be to a pronounced bacon type. There may still be a place for each one in meeting different preferences and requirements and the varying conditions to

be found in different localities. Pure bred animals are by no means essential. The average farmer should first become able to handle grades properly before attempting to do much with pure breeds. In the selection of sires and dams those possessing the greatest length and depth of side should be first choice, other things being equal. By following a system of careful selection in grading up, in the course of two or three generations there should be secured animals answering all the requirements of the trade. If a man have the money and experience necessary, doubtless he would do better to invest at once in pure-bred sires and dams, since there is always greater certainty in dealing with these.

FOOD SUPPLY AND FEEDING.

The question of breed is undoubtedly an important one, in that, in whatever line of animal husbandry we are engaged, we must have that special type of animal which is best adapted to the object in view, if we look for profit. The highest excellence in breeding counts for little if not supported by a proper supply of suitable food. Much has been said and written inclining to the belief that the modern bacon hog is chiefly the product of a certain course of breeding. We cannot but doubt this when we find that there is often as wide difference between animals of the same breed, as to type, as between representatives of distinct breeds. A pig from a certain litter may be taken, and by feeding him early in life upon bone and muscle-forming foods, letting him at the same time have plenty of exercise, he may be turned off at seven or eight months as an A1 bacon hog. Another of the same litter might be kept for the same time, but in close confinement and fed from start to finish upon fat-forming foods, with the result that he would be a "lardy" hog, entirely too fat for the bacon trade. Breed, feed and exercise are almost equally important factors in producing the right kind of pig.

CHEAPNESS OF FEEDING.

On the average, where hogs are fed on grain alone, about four and a half pounds of mixed meal is required to produce a pound of increase. This, at ordinary current prices, would mean a cost of production of from 3½ to 4½ cents per pound. On the average, we do not receive more than four cents per pound, live weight, for our hogs, so that there would be little or no profit in raising them on this basis. But in mangolds, sugar beets and turnips for fall and winter use, and clover for summer feeding, we have foods which should enable us to reduce this estimate of cost from one-third to one-half. In most sections of this State any of these can be grown with a fair measure of success. In many counties clover does remarkably well.

When the young pigs are first started to feed independently, they are usually fed on a mixture of wheat bran and shorts, the proportion of bran increasing with the age of the pigs. At the age of three months we have had very satisfactory results from the use of a mixture of peas, oats, bran and shorts. During the early life of the pig, corn should be carefully withheld, as its tendency is to develop fat rather than flesh. From the earliest period until the finishing a liberal amount of exercise is absolutely necessary, but especially during the first half of the animal's life, when the great object is the building up of a vigorous, bony and muscular framework. While not absolutely indispensable, dairy

by-products are extremely valuable, not only from the flesh-forming constituents which they contain, but also for the beneficial effect which they have upon the general thrift and health of the animals consuming them. We have been able to realize from 20 to 28 cents per hundred pounds for creamery skim milk consumed by bacon hogs. This shows that dairying and pork production can be very profitably run together.

When the young shoats are about ten weeks old they are ready to make use of clover pasture. Instead of allowing the pigs the run of the whole patch, they are confined by light movable hurdles to a small portion of it. When this is grazed off the hurdles are moved on to a fresh portion of the field, light shelters are provided for the pigs, and feeding troughs conveniently placed, in which supplementary meal rations are fed. While it is true that pigs will live and grow upon clover alone, it is neither practical nor profitable to confine them entirely to clover rations. The addition of even slight supplementary grain rations not only results in much more rapid and profitable growth, but in the production of bacon of a much superior quality. The consumption of large quantities of soiling crops results in the production of bacon which is known to the trade as soft. Soft bacon is not necessarily fat bacon, but is of such a nature that it never firms up or becomes solid either during the chilling or subsequent curing processes. It is the greatest difficulty with which Canadian packers have had to contend during recent years. Aside from the cause mentioned, immaturity of the animals is one of the most important factors resulting in its production.

Typical bacon hogs should reach the required weight mentioned in from seven to eight and a half months. During the last six weeks the rations should be so arranged that a larger proportion of what the feeder knows as strong feeding stuffs should be fed, the object being to firm up the tissues and produce hard, firm bacon. The foods chiefly used for this purpose are peas, oats, shorts and corn, to the extent of not more than one-half of the ration. Where animals have been fed during the first three of four months of their lives as previously outlined, they can be fed during this finishing period considerable quantities of corn without any danger of the bacon being of the kind known in British markets as corn fed.

As regards the wintering over of store animals, we have found that we secured excellent results from feeding them almost entirely upon mangolds and turnips. Our usual rations were from 25 to 30 pounds of mangolds fed in two feeds, morning and night, with from two to three pounds of dry, whole peas and oats, fed in the feeding troughs for the noon feed. Not only has this ration the advantage of costing with us from one-half to two-thirds of a straight grain ration, but we have found that the animals came through in much better condition and that in the springtime we had a much smaller death-rate among the little pigs. Further, the root ration is easily prepared and handled, since the old pigs are quite capable of handling the roots whole.

Since young pigs will not make satisfactory gains upon raw roots, if these are to form part of their ration they should be cooked and fed with a meal ration thoroughly mixed. Boiled turnips mixed with ground peas and oats make a very satisfactory and cheap ration. This present winter, on our own farm, we are carrying through a large bunch of young hogs, feeding raw pulped turnips and mangolds, mixed with finely

ground peas and oats. When these are mixed in alternate layers upon the feeding floor and allowed to heat gently for thirty-six hours, pigs will eat the mixture very greedily.

In conclusion, I would again say to the farmers of the State, do not rush into bacon pig production until the markets of the country will justify such a step.

THE LARD HOG.

E. A. CROMAN, GRASS LAKE.

Without exception, the United States is the home of the so-called lard hog. From this hog is produced the best side pork, ham and shoulders, that sell the world over for the highest price.

SELECTION.

In selecting our breeding stock, we should do it with an object in view: to have the framework of this hog so built that he can lay the meat on where it will sell for the most money, namely, ham and shoulders. If we get these properly constructed, the sides will be in proper shape to take on both that will make the best side pork and lard.

THE TIME TO SELL.

We should aim to market our hogs at from six to eight months' old. In that time, with proper feed and care, they can be made to weigh from 200 to 250 pounds, live weight. This kind of pork is always sought after and brings the highest market price.

THE CARE OF THE PIG.

The little fellows should be kept growing from birth to selling time. Rape and oats should be sowed early in the spring, and rye in the fall, for early spring pasture. Good, comfortable houses should be provided, also good drinking water, so the little fellow can get it just when he wants it.

THE BREED.

This I will leave with you. Any of the improved breeds well taken care of will make money for its owner.

DISCUSSION.

Wm. Ball: It is useless to discuss the relative values of bacon and lard hogs. It must be admitted that there is a demand for the bacon hog. It must also be admitted that the bacon is worth more per pound and sells for more per pound than does pork. It is a question whether a bacon hog puts on his additional weight at a greater cost per pound than the lard hog. I know from experience and observation that there is a very vigorous call from all over the State for Tamworth swine and hogs of that type. This demand is for breeding purposes. We have killed six Tamworth pigs and find they make excellent pork. We believe that the pork was produced as cheaply as any we have ever had.

E. A. Croman: It is noticeable that no stock markets quote prices on this class of hogs. The demand is rather the other way. One possible reason for the high price of the Tamworth swine is the fact that there are very few herds of that breed in the United States today.

Q. How do you finish off these bacon hogs?

J. J. Ferguson: It does not much matter how you feed these hogs the first five months, but to succeed you must exercise care in the last two months. Remember that you want a hog not covered with a thick coat of fat but with the fat well distributed and at no place over the back or shoulders over an inch thick. We must feed therefore, high foods, and cut off both succulent feeds and such as tend to produce an excess of fat. During the last month feed peas, bran and shorts. Certainly not more than one-half corn. The conditions in the United States differ from those in Canada. In this last country the bacon hog is worth more by fifty cents per hundred than the lard hog. The Canadians have not the corn to feed, and hence resort to bacon production as the most promising kind of hog raising for their conditions. You will note that the packing houses of Chicago are now catching on to the fact that England pays more for bacon than for either lard or hams, and there is to be seen the beginnings of a demand for bacon hogs in Chicago. Rape is a good feed for bacon hogs, but plenty of grain must be used with it.

IMPORTANCE OF TYPE IN PROFITABLE STEER FEEDING.

HERBERT W. MUMFORD.

During the last decade, when low prices persistently prevailed for beef cattle, a thick cloud spread over the beef cattle industry of this country. It first appeared in the heavens no larger than a man's hand; it slowly increased in size until some began to prophecy that beef cattle could no longer be raised at a profit, then it spread rapidly and settled down upon all points of the horizon, became thicker and blacker, until the most ardent believers in the industry were about to lose hope that there would ever come a time when beef-growing would again be a profitable industry on the farm.

During these years of depression for beef cattle, the dairy interests of this country were making rapid strides. The farmer, as yet unlearned in the dairyman's art, found many things to learn. One of the most important lessons he had to learn was, that not every cow was a profitable cow, even though she might receive the best of care and management.

He learned the value of these, to be sure, but he found that some cows would do much better than others with the same care and under like conditions.

Gradually there was evolved an idea that the profitable dairy cow, as a rule, conformed to a certain type. So strong a hold has this idea upon the minds of dairymen that you can scarcely take up an agricultural journal today that does not have something to say about the selection of the dairy cow, or the dairy type.

The most experienced dairymen understand that the best dairy cows do not all belong to one breed, nor yet to one type—that a cow may possess an excellent dairy form and yet be unprofitable in the dairy herd. Notwithstanding these few exceptions, for they are exceptions rather than the rule, we have never yet seen a practical, progressive dairyman who did not rely with considerable confidence upon his knowledge of dairy form as an indication of capacity and performance in the cow.

It is not a matter of sentiment with them, but one of dollars and cents. Now that Dame Fortune is smiling upon the beef producers in this country, we believe there are some valuable lessons which we, as producers of beef in this country, should quickly learn.

The feeder grows beef for the profit he can get. The consuming of the coarse fodders and grains of the farm, which must otherwise be sold below value, and the manufacture of these products into cash meat products and fertilizers for his lands, is a matter of secondary importance.

As we generally understand it, the steer is profitable when he can be sold for a price sufficient to cover not only the first cost of steer and all cost of feed, whether grown on the farm upon which the steer is fed, or purchased outright, but also to leave a cash margin when all such necessary expenses are met, the manure being considered of enough value to cover all expense of feeding said steers.

Every practical feeder, who has kept a careful account of what it costs to produce the gain in weight upon steers coming two years old, knows that he must look for the bulk of his profit in the difference per pound between the buying and selling price, and not in the actual gains made, except as they contribute to putting the animal in condition for the market.

Anything which would therefore tend to raise the price per pound of the steer when sold in the open market would be of great importance.

Before we can consider this question intelligently we must know where our steers are to reach the market; whether they are to be slaughtered at some crossroads or country village meat market or in some great packing house, or it may be, exported to grace the table of some English family.

The home market is not to be despised, but it is not usually the best market—unless we are fortunate enough to live near a large city.

Our high-class country produce must reach the great centers of population and wealth to bring us its true value. It is to these markets, then, that we should cater.

Let us examine briefly some of the conditions of such markets.

Most of our Michigan fat cattle reach the Detroit and Buffalo markets, and by far the larger per cent reach the Buffalo market.

The best export steers were selling in Buffalo for from $5.50 to $5.60 per hundredweight, while the poorest grades were selling for $3.90 per hundredweight, a difference of nearly $1.75 per hundred pounds.

This seems to be a considerable difference, but as a matter of fact the difference is much less than we generally find.

Now, what makes the difference in price? In comes largely from the difference in type of the fat cattle offered for sale in that market.

Let us understand just what is meant by type. In the first place, type and breed are not identical.

A breed refers to a class of animals which are very similar in breeding, size and form, and generally in color and markings. They must not only possess these characteristics in common, but also they must have been bred for a long enough time along these fixed lines to be able to transmit their various characteristics to their offspring.

A type refers to a class of animals which have similar form, fleshing characteristics, and other qualities which render them especially adapted for certain purposes, for example, the production of beef, of milk, butter

or cheese, for heavy draft or carriage purposes, the production of veal or mutton.

To conform to a certain type it is not necessary for the animals to be similarly bred.

Not all animals of the same breed conform to the same type, as is seen in the Shorthorn breed; we have seen fine-bred Shorthorns which conform to the dairy type and pure-bred Shorthorns that conform to the beef type.

Several breeds may have individual animals belonging to the same type. The term type is then a broader one than breed. We find the majority of the animals of the Shorthorn, Galloway, Aberdeen Angus and Hereford breeds belong to the beef type. We have, too, a very large number of animals not belonging to any breed, that are cross-bred, grades and scrub cattle that may belong to either the beef or dairy type.

The most important thing is, that our steers conform to a certain beef type, and not that they belong to a particular breed.

It is as certainly true that all steers do not make profitable feeders as it is to say that all cows are not profitable cows, even though they are fed in the best possible manner.

To be a profitable feeder a steer must not only have the proper form, but also he must be a good feeder in the sense of being able to convert a large part of the food consumed into flesh and fat. It is not always the steer that makes the greatest gains in a given time, nor the one that brings the highest price in the market, that is the most profitable feeder. Generally speaking, however, it is true. The rapid growing, flesh and fat taking steer is, as a rule, the one that makes the most economical gains.

The steers, too, that bring above the average in price in the market are generally the money makers, while those bringing below the average are the ones that have been fed at a loss.

The animals which bring above the average in price have certain very noticeable characteristics. First, as we have already said, they conform to the beef type. The beef type in short is a form which shows to the buyer that the steer has laid on his flesh where it is most valuable to the wholesale and retail dealers in meat. Second, the steer must be well finished or fattened, that there will be a small amount of waste in dressing and that the beef will be of good quality.

Experience has proved to successful feeders that there is a close relation between the breeding of a steer, provided it is an average specimen of the breed, and the price that that steer will bring in the best markets.

It is the exception rather than the rule when a steer, no matter how it has been fed, which has no particular breeding and is a mongrel or scrub, will bring the highest price in the market. On the other hand, by far the large majority of well-bred steers, that is steers that have been graded up to high grades of some of the beef breeds, or it may be cross-bred steers, being produced by a cross between two of the recognized beef breeds, is not capable of being fed to reach very close to the top of the market.

A good lesson in this connection can be learned from the sales made of fancy Christmas cattle for the past few years. The cattle which have brought the fancy prices have been well bred cattle, either pure bred, high grades or cross-bred animals.

Experience has shown that the Jersey or Holstein steer is not a profitable feeder. The principal reason for this is, that no matter how they are fed they do not lay on flesh on the parts which are most sought by consumers and for which they are willing to pay an extra price.

Experiments go to show, too, that the Jersey and Holstein steers dress away more in killing than do specimens of the beef type.

We do not wish to be misunderstood in regard to the relation of the breeding of a steer and the price he will bring on the market. It is not because he is a Hereford, an Angus or a Shorthorn that he brings the extra price, but it is because he conforms to a certain type which is demanded by the dealer. The dealer demands it because his customers demand it.

The beef breeds have been developed to meet this demand and they do it admirably. The steer with no good beef blood behind him does not and cannot fill the market requirements.

To conclude, then, we may say that profit in steer feeding depends upon:

1. Type and cost of steer selected.
2. Judicious feeding.
3. Form and quality of finished product.
4. The relation between the cost and selling price.

First, the steer selected should have a form which indicates that the steer when finished will carry his flesh where it is most valuable to the vender of the dressed carcass. He should have good quality, a loose, pliable and mellow feel, as indicating a good feeder. He should possess a considerable quantity of the blood of some recognized beef breed as a guarantee of his flesh-taking ability. Let us remember that the three prime requisites of the profitable breeding steer, then, are form, quality and breeding, no one of which can be lacking without detracting from his value as a profitable feeding steer.

When purchasing steers these characteristics must be taken into account. Better pay an advanced price for a steer of the right type than take a poor feeder at a low figure.

Second, We will leave the subject of judicious feeding to those who follow.

Third, the form and quality of the finished product will generally take care of itself if the right sort of steers are selected to feed and are judiciously fed.

Fourth, The relation between the cost and selling price can be regulated, first, by intelligent and shrewd buying, and, second, by bringing to the market a finished product. We confidently believe that the markets of the future will be more discriminating than they have been. That is, there will be a greater premium placed upon well finished steers of the right sort, and the half fat steer that carries little flesh on his bones and much fat in his paunch will be slow sale at any price.

The farmers who soonest adjust themselves and their feeding operations to conform to the existing and the prospective great cattle markets of the world will soonest make their steer feeding ventures an assured success, while those who are slowest to learn will swing into line just as, in the natural order of events, the most progressive feeders are retiring from the business.

Retiring because they can afford to do so and because the great mass

of our population will some day be calling for more butter and less beef. Not that people will eat less beef and more butter, but that there will be plenty of beef and a scarcity of butter.

SILAGE FOR FATTENING STEERS.

CLINTON D. SMITH, AGRICULTURAL COLLEGE.

I regret that we have not with us today the gentleman to whom this topic was assigned, Mr. John S. Gilbert of Harbor Beach. He has had a long and successful experience in the use of the silo in steer feeding, and I know that you would value his practical work far above anything that I, who must speak from observation only, can give you.

The success of cow feeders in the use of a silo for milk production led me to wonder whether it would not shortly fill an equally important role in fattening cattle. I therefore planned an experiment at the College where an equal area of corn field was harvested in three different ways. One area was cut in the silo, another was cut and husked in the usual way; a third was cut, bound in large shocks, which were drawn unhusked to the barn, run through a fodder cutter and fed, stalks and grain mixed.

A carload of steers were purchased in Chicago, divided into three lots, and the corn harvested in the different ways fed to them. I cannot now give an official report of results of that experiment. It is sufficient for my purpose today to say that the results were not conclusive, and did not point to marked advantage on the side of the silo. Let me refer to experiments made in Canada.

Turning to the Sixteenth Annual Report of the Ontario Agricultural College, 1890, page 118, Prof. Shaw reports: "That corn silage and meal will fatten as effectively and as cheaply as a ration of roots, hay and meal, and with a less expenditure of labor." One group of steers was fed an average of 79.4 pounds of silage and 12.7 pounds of meal per day. There was left uneaten of the silage 18 pounds per day of the coarser portion, but the whole amount fed was charged against the steers. Group 2 was fed daily 41.6 pounds of silage, 11.3 pounds of hay and 12.7 pounds of meal. There was left uneaten of the fodder 13.5 pounds per day, which amount was also charged against the steers.

Group 3 was fed daily 14.3 pounds of hay, 41.6 pounds of roots and 12.7 pounds of meal. The meal in all cases consisted of equal parts, by weight, of peas, barley and oats, and was mixed with the other feed. Here are the results.

	Weight at beginning. Pounds.	Weight at close. Pounds.	Total gain. Pounds.	Average daily gain. Pounds.	Cost of feed per day.
Group 1	2,842	3,282	440	1.85	$0 21.02
Group 2	2,862	3,304	442	1.857	20.74
Group 3	2,818	3,222	404	1.697	21.40

Before discussing this table let us take up the work of the next year, as reported on page 126 of the Eighteenth Report of the Ontario Agricultural College. In this experiment, group 1 was fed all the ensilage the steers would eat clean, with approximately ten pounds of meal per day per animal. Group 2 had thirty pounds of silage per animal per day, the same amount of meal as in group 1, and all the cut hay they would consume. The steers in group 3 were fed each 45 pounds of sliced roots per day, the same amount of meal as near as may be, and all the cut hay they would consume. Here are the results:

	Group 1. Pounds.	Group 2. Pounds.	Group 3. Pounds.
Weight at commencement	1,298	1,399	1,364
Weight at close	1,581	1,601	1,607
Gain per animal	283	202	243
Average daily gain	1.89	1.35	1.62

It is to be recorded that one of the steers fed silage died before the proper conclusion of the experiment, and that another was off his feed. Prof. Shaw concludes "that from the behavior of the animals fed ensilage and meal we do not consider this ration a perfectly safe one for finishing live stock in beef making, as, out of the six animals fed upon it, two died, and three were occasionally off their feed." He shows, however, that the average daily cost of the ration was less with silage than with roots, hay and grain, and that the average daily gain was greater.

Turning now to the practical experience of cattle feeders, we find that Mr. Gilbert has had unvarying success with silage as a principal factor in the ration of fattening steers. He is, moreover, feeding steers in sufficient numbers to show that where the silage is properly handled it is not inimical to the health of the animal.

He has demonstrated, farther, that there is a profit to be made under present conditions from feeding silage to steers. He finds no cheaper way of handling the corn crop to convert it into beef than to store it in the silo, where the major part of its food value is preserved, and from which storehouse it is easily and economically fed.

Mr. Gilbert is not the only one in Michigan who is finding it to his financial advantage to feed silage to steers. The method is in use about Port Huron with equally good results. I am led to believe, therefore, as an observer, that the day is not far distant when steer feeding in Michigan will be very largely increased, and that the silo will play an important part in the feeding of the steers.

FEEDING STEERS WITHOUT SILAGE.

WM. BALL, HAMBURG.

Whether this subject as given me, following the fattening of steers by the use of silage, was for the purpose of discussing the relative values of the two methods, one with and the other without silage, I am unable to determine. I will say, however, that so far as I have been able to ascertain, and I have taken considerable pains to study the methods by which the numberless highly finished steers have been produced, I cannot find a single instance where ensilage has been used. I mean the steers which have brought the highest price per pound in the Chicago market, even reaching eight and one-half cents per pound during the present season. The inference then is, that while ensilage may be an assistant, it is not a necessity in the development of the steer or in finishing the highest type of a beef animal. In the sales of high-priced steers which have been noticed in the Breeders' Gazette, corn has been the main factor in their production outside of pasture and water.

So much has been written and so much has been spoken on this very important subject, it seems as though nothing new can be offered. It is, however, of so much importance to the farmer and stock grower that attention cannot too often be called to it. I am not disposed, even were I able, to discuss this important matter from a scientific standpoint. I shall have nothing to say of carbohydrates, protein, balanced rations, etc., which may be necessary in conducting feeding experiments, but from the standpoint of the ordinary farmer who grows his own steers and feeds the produce grown upon his farm. The main incentive to labor is the reward expected in the form of a living or in accumulating money. A large majority of the farmers in Michigan are engaged in diversified or mixed farming. Whatever the farm is capable of producing to the best advantage should be produced. On most farms stock, when properly bred and properly fed, proves to be the most remunerative.

To be practical, all farmers engaged in mixed farming own cows. They should be of those sorts that are good for beef and for dairy purposes. The steers should be fed especially for beef. The heifers intended for the dairy should be fed practically for dairy purposes. The other heifers for beef in like manner as the steers, either in a natural or spayed condition. The demands of the market now are for well finished steers or heifers at from twenty to thirty months of age, weighing from thirteen to sixteen hundred pounds per head.

To prove that steers well bred and properly fed will pay well, and within the ages above mentioned, I will quote from the Breeders' Gazette some of the sales made in Chicago recently: October 16, two carloads of steers fed by C. F. Shaffer, Iowa, sold at home for 6 cents per pound, two-year-old high grade Shorthorns, weight average 1,400 pounds. November 29, fifteen Shorthorn grades, averaging 1,546 pounds, fifteen head, price $6.75 per hundred. Same day, eighteen head, averaging 1,480 pounds, price $7.00, age between two and three years. December 6, twenty-nine head Galloways, averaging 1,521 pounds, price

$7.00 per hundred, age between two and three years. December 20 quoted sixty-eight head of Shorthorn steers, fed by R. M. Peet, averaging 1,448 pounds, price $7.00 per hundred. Two carloads Shorthorn grades, averaging 1,380 pounds, price $6.90. Seventeen head of grade Herefords, eleven heifers and six steers, averaging 1,282 pounds, price $6.85. Nineteen yearling Herefords, 1,224 pounds, price $7.25 per hundred. Sixteen Angus grade steers, averaging 1,536 pounds, price $8.25 per hundred, age two years. Two Angus steers, averaging 1,715 pounds, price $8.50 per hundred, age two years. January 10, bunch of calves and yearlings, averaging 960 pounds, price $6.35. I have quoted at some length to show what has been accomplished and that the producers of these cattle made money; also to show that the markets for beef demand finished animals at an early age. As far as I have been able to learn the history of the feeding of these cattle, corn has been the main grain fed. Other grains in minor quantities were given, skillfully mixed by men of thought and intelligence. Every farm, or nearly so, is capable of producing the cattle and the feed necessary to grow and finish the steers if proper means are used. I am well aware that Chicago is an exceptionally good market for stock and that Christmas comes but once in a year, and that most of the prices quoted were for holiday beef; but they show what can be accomplished in the way of rapid growth and early maturity of beef-producing animals. The highest prices for well finished steers since the holiday trade have been $6.00 and upward for weights ranging from 1,300 to 1,500 pounds: January 3, $6.45; January 10, $6.65; January 17, $6.50; January 24, $6.27½; January 31, $6.25; February 7, $6.30; February 19, $6.10; February 21, $6.15. These figures all go to show that where steers have been well bred, well fed and finished at an eary age, they have been money makers. The markets in our own State have not shown such prices, neither have such steers been offered for sale. However, when anything approaching first-class cattle have been offered, prices have materially strengthened. Large quantities of the better qualities of Chicago beef are sold by the side in our midst, having been shipped here by Chicago dealers, showing that people in Michigan desire a better quality of beef than is generally produced by our farmers. Corn in one form or another is the main factor in the grain ration for fattening cattle, sheep and swine. In looking over the statistics on the yield of corn for the last ten years, as furnished by the Agricultural Department in Washington, I find that the average yearly yield is slightly in favor of Michigan as compared with Illinois, the yield in each State being in excess of thirty bushels per acre. Such being the fact, the Michigan farmer can produce beef as cheaply as the Illinois farmer, other things necessary to beef production being equal. As has been said before, every successful farmer owns cows; he raises his calves; he can raise the corn, oats, hay, stalks, and furnish pasture to grow and fatten them in first-class condition for market, being assured that for such production he will receive remunerative prices.

The future prospects in beef production as regards prices are good. The percentage in shrinkage of beef cattle for the last ten years has been very marked. The deficiency cannot be filled as quickly as a like shrinkage in swine or even sheep, and as prices depend a good deal upon the supply and demand of any product of consumption, the outlook is very good for the beef producer. While the shrinkage in beef cattle has been

large, the increase in population has also been large, and larger quantities of beef will be consumed. Add to this the fact that the working people are consuming much more beef than during the past number of years on account of having more work to do at better wages. With the same financial policy as existing at present, if continued, there is much encouragement for the production of beef cattle, and that farmer is wise who devotes more time and land in the future to stock growing and less to the production of cheap wheat.

While some of the thoughts presented are not particularly germane to simply fattening steers, I have presented them as worthy of consideration in calling attention to the necessity of changing a system of farming that is robbing the fertility of our soils in too much grain growing. The Superintendent of Institutes wrote me to present some of my latest thoughts on the subject, which seemingly gave me a latitude that I have improved.

In the production of beef the aim should be to produce the highest quality and largest quantity in the least space of time with the least expense in food. To accomplish this object three requisites at least are necessary: First, Steers that are high grades from among the best beef breeds, Shorthorn, Angus or Hereford. Second, How shall they be fed, grown and fattened? Third, Who shall feed and care for them?

As this paper applies more particularly to the ordinary farmer, the method suggested should apply equally to a smaller or larger number of steers. The calves should be dropped in the fall during the months of September or October. The calves can be fed milk until grass comes the next spring and be of an age to wean with good results. As the winter markets for beef are better, as a rule, than summer or fall markets, it will give plenty of time to have them in prime condition at the age of thirty or more months. The calf should become a steer at the age of two months or less. He should be fed whole or new milk for three or four weeks. Then skim milk should be fed once a day for a couple of weeks, when it should comprise all the milk fed. At this age the calf will eat some hay and grain. I find it a good plan to feed skim milk three times per day, warmed if the weather is cold, and a little grain twice per day, consisting of wheat bran and oats mixed, increasing the amount gradually as age and condition require. For the first twenty months the aim should be to get a good, substantial growth, with a proper amount of flesh. The steer should be heavier at night than in the preceding morning. When weaned he should have good pastures, with access to pure water, and grain, corn and oats if necessary. In order to keep up the every day growth when pastures get poor, he should be fed plenty of corn fodder, which any farmer may have if he desires. The second winter the steer should be kept growing, grain enough being fed to keep in good flesh. I would feed corn two parts, oats one part, ground, in such quantities as a prudent feeder should deem necessary. The roughage should be corn stalks, hay, straw, etc. Good comfortable stables are a necessity. The last ten or twelve months more corn, less other feed, the idea being to lay on flesh as fast as possible until fit for the higher prices. Here is where the third necessity comes in, the feeder. He should be able to regulate the ration, know the needs of each animal fed and try and supply them.

Mr. Gilletts, one of Illinois' most successful feeders of highly finished

and high priced steers, on being asked how he accomplished such results, replied: With water, corn and blue grass. There is nothing in the feeding operations suggested that cannot be applied by every practical and intelligent farmer. In my opinion, the farmer who breeds the steer and feeds him until weaning time should feed him until he is finished for market. If one feeder can buy yearlings or two-year-old steers, buy feed and make a profit in so doing, why should not the breeder do so? He raises his own hay, furnishes his own pasture, grows his own grain, and he should feed it on his own farm, where much of its value is returned to the farm in the form of the most valuable fertilizer. Is there any satisfactory reason why Illinois, Iowa and the farther West should furnish practically nearly all prime beef animals. Michigan has good soil, good water, intelligent farmers. Formerly her fields and barnyards were adorned with well bred and valuable beef animals. We have in this State intelligent breeders of thoroughbred beef cattle who have to seek a market in the West for their surplus bulls at anything of a fair value, while every male of good quality and many times more are needed to improve the breeds of cattle as now scattered over the State. Is it true that the business intelligence of this country is west of Lake Michigan? Shall it be longer said that the farms in Michigan, or too many of them, shall longer be despoiled in fertility by too constant cropping of cheap wheat and beans. The farms of the West are kept fertile by the large amounts of stock grown and fed upon them. Chicago and Buffalo markets are accessible to Michigan farmers. Let them raise more general purpose cows, good for dairy and beef purposes, more corn, more hay, more roots, more of any coarse grains to be fed on the farm and sold in the form of beef, wool, mutton, pork, poultry, butter and cheese, and less wheat and rye.

Let the special dairyman breed his valuable Jerseys or Guernseys or Holsteins, especially adapted to the ends he seeks; let him build and fill his silos with corn and stalks and feed it as he thinks best, and I have no doubt about its value for his purposes, but the ordinary farmer, engaged in diversified farming, needs to study the capabilities of his farm, its needs and requirements, and how best to determine what number of sheep, swine, horses and cattle he can keep well, all of which he is obliged to have. I have said repeatedly, and I will add it here, that it takes a certain amount of food and care to keep an animal in growing condition. If any profit accrues from what has been fed, it must come from the small amount of extra feed given to aid in the fuller development of the animal. The good results which follow from the small extra amount fed cannot be overlooked if success is attained. The profits in stock raising do not come from the numbers kept, but from the kinds and manner in which they are kept. No farmer should excuse himself for not bringing out the best results obtainable from the animals he breeds because in his method in diversified farming he is obliged to have horses, cattle, sheep, swine and poultry. There is no question regarding the necessity of improving a very large percentage of the farms in this State. I know of no way that this improvement can be made so well as by feeding the products of the farm to well bred varieties of domestic animals needed in farm operations. I am well aware that I have used considerable latitude in treating upon the subject given me, but its importance, aside from the mere idea of feeding the steer,

must be my excuse in so doing. If what has been written will aid in a revival of an interest in the breeding and feeding of domestic animals it will not have been in vain.

DISCUSSION.

C. D. Smith: I want to repeat here what I have said at a great many Institutes in many sections of this State concerning the relation of certain distinct dairy breeds to beef production in this State. I believe that the dairy breeds, especially the Jerseys, have done incalculable good to Michigan by improving the blood of the dairy herd. But I believe, also, that the introduction of Jersey blood into districts which are and ought to be given up entirely to beef production has worked serious injury to those sections. The time was, for instance, when a buyer could find, not one, but many carloads of steers, in the thumb, fit for sale in the most discriminating markets of the country. On their carcasses the great weight of beef was stored on the loin and along the spinal column, where it would bring the most money. Today it would be hard to find in those same regions many steers of a high class, and the decadence in quality is due in no small degree to the introduction of bulls of the dairy breed.

A Farmer: It must not be forgotten that the states west of the Mississippi raise corn much cheaper than we can. Hence they can beat us in beef production, and I fear that the time has not yet come when it is safe for Michigan farmers to go heavily into the fattening of steers.

Wm. Ball: We are feeding steers, not only because we can make some money, but because we want to feed up on the farm the coarse feed which we raise there, and with us steers have proved a profitable way of doing it.

A. B. Cook: It seems to me that the ensilage question is a special question. One man may make a success of it while another does not. The question of the right type of cattle is one of paramount importance. As an instance of its importance, I may say that I have recently sold a cow for four cents per pound, while at the same time some of my neighbors sold two carloads of steers for $3.75 per hundred weight. The latter believe in raising Jersey calves for steers. It is folly to put fuel in an engine that is not adapted to its purpose.

Q. How should you feed corn, ground or unground?

Wm. Ball: We grind because it is convenient and because it seems to us more economical.

L. W. Oviatt: We must have the proper type of steers to feed if we are going to make any money. On the other hand, we cannot afford to keep a cow in our section of the country just for the calf, and we must therefore have a cow that will give some account of herself at the pail. Hence our demand for a general purpose animal. I am feeding steers in a small way. We are feeding the corn almost entirely unhusked. I also feed sheep and lambs. For these animals I shell the corn. My neighbor does not: he feeds the corn unhusked to his sheep and lambs and they weigh out nearly as well as mine.

Mr. McDougal: I have fed corn both ground and unhusked. To me the latter is the most satisfactory method. One man can feed a much larger herd of steers and thus economize human labor, and when the method is judiciously followed there is no more waste than when the steers are fed meal. Mr. Eggleston of Parma has extensive racks in which the corn is fed, and there is no waste of the food material. So my neighbor has tried grinding the corn and feeding unhusked, and has adopted the latter method because of the expense and trouble of husking and grinding. Another neighbor cuts the corn and stalks in a cutting box, and feeds in that way.

W. C. Stuart: I can't see where there is much gain if the corn is bound in big shocks and hauled to the barn when needed. In our part of the State we have three feet of snow sometimes and sometimes none at all. In the latter case the heavy soil is very muddy and you cannot haul the corn when you want it. What does it cost to produce a pound of beef? There are two bunches of steers being fed near me this winter: one has ground feed and the other corn in the stalk. They are well graded shorthorn steers. Those tied in the stalls all winter and fed meal are fully a third better now than those fed in the open on corn unhusked.

Allen Ramsay: I am feeding two carloads of steers this winter. Mr. Gilbert, who lives near me, feeds silage for succulent food. I feed whole corn hauled from the field and run through the cutting box. Through the main part of the feeding period I feed whole corn, later I grind the grain. Pigs are running after the steers, but toward

the conclusion of the fattening period I have to feed them much more than when I am feeding the steers unhusked corn.

L. D. Watkins: I cannot tell exactly what it costs to produce a pound of beef. Our method is briefly as follows: We cut our corn with a binder, stand the bundles up in good sized shocks and bind tight about the top. The corn then keeps in better condition for feeding than when cribbed and dried. This method saves cribbing and husking. The shocks have from 25 to 30 bundles as they come from the binder. They keep perfectly. I feed in the lots where I want the manure. I believe in this open air feeding. A steer should never be tied, but should be fed in the open air. My neighbor, F. Hart Smith, is in my estimation the best steer feeder in Michigan. He has large barns that would hold a carload in each, yet he now feeds entirely in the open air, and this in all kinds of weather. Is it not possible that a lower temperature causes better assimilation? Experiments with lambs have demonstrated that they make better gains in cold weather than in warm on the same feed. Our methods economize human labor, do not waste feed, and secure the most rapid and economical gains on the steers.

Wm. Ball: I do not think the methods of Mr. Watkins would work on a small farm.

L. D. Watkins: We must turn about in our method. We must raise less wheat and raise stock instead. We must feed the entire year. With us each cow raises during the year three calves.

FRIDAY AFTERNOON.

NEWBERRY HALL.

TOPIC—LIVE STOCK CONTINUED.

Wm. Campbell in the Chair.

THE POSSIBILITIES AND ESSENTIALS OF HORSE-BREEDING IN MICHIGAN.

ROBERT GIBBONS, EDITOR MICHIGAN FARMER, DETROIT.

Mr. President and Gentlemen:

In what I shall say on this subject I shall confine myself largely to the commercial end of the business—the results attained by the breeder, not the details with which he must be familiar before he can expect to succeed. The essentials for the business of breeding horses in Michigan are, I take it, the same as in every other state. The first is a suitable location, the main point being the character of the soil. The horse is an animal that requires a dry soil, lying high, and more or less rolling, producing short, sweet grasses, and having pure, clear water always accessible. Low, level land, producing a heavy growth of grass, and with a soft or mucky soil, can never produce horses of good bone and sound, hard feet. If we look back at the history of the horse, either in foreign countries or our own, in every instance we will find that the land upon which horses have been bred and raised has determined their characteristics and controlled their conformation. Those coun-

tries which have gained a high reputation for the quality of their horses, such as Arabia, the Barbary States and Persia, in Asia and Africa, France and Belgium in Europe, and the British Isles, have the great essentials of proper soil and pasture for their production, and we find their size generally proportioned to the abundance with which proper food and water is attainable by the animals while growing to maturity.

In our own country we will find that the states which have been most noted for their horses also possess these characteristics. Take Vermont, for instance, with its green hills, approaching to mountains, the soil hard and stony, the water largely from springs, and we recognize the natural conditions which gave us the Morgan horse—the Arab of the new world—with their small size, hardy, vigorous, proud and spirited, with feet of iron and bone of ivory. Then look at Orange county, New York, where under splendid natural conditions the blood of imported Messenger mingled with the hard-bottomed mares of that part of the state, gave us the foundation for the American trotter, the greatest light harness horse in the world. In Kentucky and Tennessee natural conditions were good enough to place those states first in the production of the thoroughbred, the basis of improvement of all horses for racing, riding or driving purposes. Of course there are many other states which have sections peculiarly adapted to the raising of high-class horses, but these natural conditions have been more generally used in the states named than in any others. Coming to our own State, we find large areas peculiarly adapted to the business of raising horses. The counties of Washtenaw, Oakland, Jackson, Livingston, Hillsdale, Branch, Ingham, Barry and Ionia, as well as parts of Van Buren and St. Joseph, offer excellent opportunities for the breeding of horses; and this belief is encouraged and proven by the records that horses from the counties mentioned have made in the sales ring, on the track and in actual use in all places where the medium and light harness horse can be used. They outclass horses of the same blood and breeding from Illinois and Indiana, or any state where level land and soft black soil furnish conditions for corn and hogs. The hard roads and hills of Vermont gave the Morgan his tough feet, clean limbs, expanded ribs and deep chest which marked the breed, and the same conditions in other states will always produce the same results. Therefore, when we see a farm with fields covered with short, sweet blue grass, with clear spring water, and the land rolling and with plenty of limestone in its composition, we know that we have the first essential for breeding high-class horses.

Next to the soil must come the man. Without him there can be no utilizing of the advantages which nature has furnished. The characteristics of the man will surely be reproduced in the horses he breeds. Kindness and good temper in the horse may be the result of heredity, as is viciousness and stubbornness, but each can be added to or modified by the man in whose care he has passed his early days. The greatest breeders, the most successful in every way, are those who associate most closely with their horses, secure their confidence, and thus start them in life with the belief that every man is their friend. This always increases the intelligence of the horse, and good temper and intelligence, rendering them susceptible to high training, are qualities that do, and should, command a high price in the market. The vicious horse is never wanted, is always a source of trouble and cost, and

frequently of disaster. Hence in selecting breeding animals, while high spirit and courage are qualities very desirable, in fact essential, in the sire, viciousness or stubbornness should never be tolerated. They mean absolute loss of cash when the progeny goes to market—and they should, for they mean positive danger to their future owners. Then the man who breeds horses should have a positive liking for them, understand their nature, the history of the particular breed he has selected, with its inherent characteristics, its merits and defects—that he may work toward the elimination of the one and the increase of the other.

With the farm and the man, the next point is a selection of the breed. The importance of this problem cannot be over-estimated. Different men, each admirers of the horse, will select different breeds, and it is well that this is so, for we must have various classes of the horse to meet the requirements of different people engaged in different lines of business. It is best for the breeder to select the one for which he has the greatest admiration, for he will then take pride in the business and give it his best attention and judgment. If he favors the heavy draft horse, with his ponderous frame and power to draw heavy loads, with freedom from nervousness under all circumstances, he can engage in it with the assurance that if he produces good animals there is always a market for them at remunerative prices, and that they will require less looking after and give less trouble in breaking and training than any other breed. His principal care will be to get size and weight, with quality. They are more subject to bad feet and spongy bone than the lighter breeds, and to avoid these troubles will require skill, care and good judgment. Those are the weaknesses of the draft horse, and to achieve success in breeding them it is absolutely essential to eliminate them to the greatest extent possible. This is a good class of horses for farmers to breed, for the brood mares, capable of producing such horses, will easily pay their way on the farm, and the colts will be profit except the service fee and cost of maintenance to a marketable age. Besides, they can be put on the market in good shape to sell well at less cost than any other class.

But many people do not want to raise heavy horses. So much the better. If everyone did there would be such a surplus that the owner could not get cost of production. For these people the lighter breeds represented by coach and carriage horses, and the driving horse, offer a paying and legitimate business likely to become more profitable every year. The breeds are numerous in this class of horses. We have the foreign breeds—the French and German Coachers, and the English Hackneys—each with their admirers, and the American trotter, which personally I believe to be the most generally useful of all the lighter breeds. It may be well to remember, in saying anything of these breeds, that their foundation and improvement comes from the same source—the thoroughbred—and the thoroughbred in turn from the Arabian and the Barb. The difference between them comes from the different classes of mares used in forming the breed, and the differing views of the breeders who have been engaged in producing them. The French and German coachers are the result of breeding for a horse that would fill the requirements of a cavalry remount or an artillery horse. These horses must have size, substance and activity, and the respective governments of the two countries named have taken a great deal of interest, and

went to heavy expense in their development and improvement. In many ways they are a desirable class of horses. The results so far obtained in breeding them in this country have not been up to what I expected. But this may come from the class of sires imported, or that the mares bred to them have not been of the right stamp. The English Hackney has many warm friends and a great many detractors. I think for the purposes he is used in England, a horse that can be ridden or driven in a trap by the wealthy classes, who want a smart, up-standing, high-stepping animal, with a well-shaped body and stylish head and neck, the Hackney is all right. He will also sell to the smart class in our eastern cities who wish to follow English styles, but as a business horse I consider him inferior to either of the others named. His excessive action will knock his feet to pieces on the hard pavements, and he has not the speed at the trot to recommend him to the American driver. I have been watching the reports of the class of horses driven on the speedways and boulevards of the cities of New York, Boston, Philadelphia and Chicago, and if there is a single Hackney in use the fact is never mentioned by the newspaper reporters who furnish us with descriptions of the double teams and single drivers that are driven by the wealthy people of those cities.

The American trotter has his weak points as well as the other breeds. They come largely from his popularity. Bred mostly for speed, anything that had speed was bred to, and if the progeny was only fast, no matter how deficient he might be in conformation, style, action or size, he would bring a good price. Under such a system as this no wonder we had a miserable lot of runts and ill-shaped animals that become unsalable and worthless when the boom in the business exploded. The past eight years, with its limited market and demand for a better class of horses, has done much to improve the trotter. There has been a great weeding out of the plugs and runts, and at the horse shows in the large cities he is now a strong, and frequently successful, competitor, with the best of the foreign breeds in the coach and driving classes, while in speed at his gait he is the champion of the world. It is the draft horses, such as the Percheron, Shire and Clydesdale, and the American trotter, that are filling the foreign demand, and the prices they are now selling for affords a good margin of profit for those who are engaged in breeding them. As a market for what is raised is an essential for the successful prosecution of any business, there is every prospect, in the expanding demand for American horses, that the future promises even greater rewards for the man who raises good ones than the present.

In looking over the reports of the Chicago market for the past few weeks what impressed me most was the number of foreign buyers present and the classes of horses they were taking. One man from Iowa had fitted up fourteen head of drafts, which he had been feeding for some months, and they sold in Chicago for an average of $219.64. They were Shires and Percherons, and ranged in weight from 1,900 to 2,300 pounds. Another bunch from Illinois averaged 1,850 pounds and were models in conformation and bone, and sold for a total of $2,300, an average of $230 per head, the best price for such a bunch this year. In this lot were three chestnuts, averaging 1,850 pounds, and so closely matched that they could hardly be distinguished, which sold to one

person for $765, an average of $255 each. These horses were all taken for export. On the same day a lot of drivers from Iowa, of Bashaw blood, were sold and averaged $249 per head. Four of them brought $300 per head. These horses were not speedy, nor trained for speed, but sold for drivers and matched pairs. A good many of them went to foreign buyers, mostly to English dealers, while the heavy horses went to the continent. Ten head of them, taken for Hamburg, Germany, are said to be the finest and highest priced lot of drafters ever taken for export.

On another day, at an advertised sale at the Chicago Stock Yards, with a large number of trotting-bred horses on sale, the prices reached by a number of them, which sold solely on their appearance, as they were geldings, one named Royal King brought $1,650, and though purchased by a Chicago party, a London dealer bid up to $1,600 for him. He is a six-year-old bay gelding, sired by Jaywood, a son of Nutwood, brother of Maud S. He is described as a beautiful animal of the best coach type, elegant in conformation and with splendid action. Others sold from $250 to $875 per head, quite a number going to England, the home of the Hackney. In fact the surprising manner in which the American trotter is making his way in Great Britain and Europe is one of the surprises of the past few years to European dealers and breeders. We have Russian, Austrian, German and English buyers at every sale of any importance, and there are breeding studs of American trotters established in Russia, Austria, Italy and France. At the recent Splan-Newgas sale of trotting-bred horses, 300 catalogued from Ohio, Missouri, Michigan and California, sold for a total of $75,000, an average of $250 per head. These horses were coachers and drivers, and it was the largest lot of this class of horses ever offered at a sale in this country. For a brown, 16-hand, eight-year-old gelding, named Wellington, a horse of the finest coach type, $2,000 was paid by a dealer.

These prices show the possibilities of the business in this State. They are more likely to improve than decline. This is the only country that foreign nations can rely on as being able to furnish horses for their armies, in sufficient numbers and of the right stamp. The present war in South Africa is emphasizing these statements. We note that the German government is sending a special commissioner to this country to report upon its breeding studs and methods of management, so impressed have authorities on the horse in that country been with the high character of American horses, their speed, docility and stamina. A few weeks ago the London Live Stock Journal, after watching the showing made by American horses against the finest in the United Kingdom, suggested that a commission be sent to the United States to study the method of breeding and management that produced such a wonderful class of horses. But I need not say more on this subject. Every person who has studied it must know that, given the essentials, the breeder of horses in Michigan has as great and promising possibilities as exist in any line of production on the farms of the State. The future of the business is more assured than ever before in its history, because founded upon a more substantial basis. It is individual merit and the positive requirements that exist that are bound to place the breeding of horses in the United States on a higher plane, and make it more remunerative than at any former period in its history.

WHAT TYPE OF HORSE SHALL THE MICHIGAN FARMER BREED?

HERBERT W. MUMFORD, AGRICULTURAL COLLEGE.

It might be asked, shall the farmer breed horses at all?

Most of us do not appreciate the importance of the farmer in the horse breeding industry.

The fact is that by far a large majority of the horses reaching our city markets were raised upon the farms of this country.

The horse breeders, strictly speaking, do not mean to produce many individuals which are not too good to go to the open market. They concern themselves with the production of sires and high class breeding stock.

We should look upon the farmer, then, as a great factor in the horse markets of the future.

The horse breeder can afford to have a sire of high quality and brood mares of more than ordinary shape, style, action and finish.

In the past the great bulk of horses have been produced from very ordinary and inferior mares of all types, in the hands of the farmers. The sires, too, have been good, bad and indifferent, such as they could get access to and often preferring to breed to a part bred stallion of little character but low service fee, than to breed to a pure bred sire possessing quality and prepotency.

The period of depression in the horse breeding industry in this country extending from 1893 to 1897 has taught the horse raisers of America many valuable lessons which I fear are apt to be forgotten so soon as the scarcity of horses will make it possible to sell almost any kind of a horse with more than ordinary size for a good price, which time in the judgment of the writer is very near at hand.

The development of the export trade in horses since 1893 has had much to do with fixing the types, grades or classes of market horses in this country. A market horse must now have a certain type to command the highest price in market.

In a few short years the time will come again when the buyer will not be obliged to take almost anything to supply an active demand, but the supply will be ample and the buyer will pay good prices only for the very best that have been bred for a special purpose.

Nearly all countries are represented at our great horse markets, and it is one of the hopeful indications of what the future will be that when we have a large surplus of horses in this country foreign buyers will be on the market ready to take the surplus of good horses at paying prices.

The various types of market horses are as follows:

1. The Draft horse.
2. The Coach horse.
3. The Cob or Hackney.
4. The Roadster and American Trotter.
5. The Saddle horse.

We have three classes of draft horses, the light, medium and heavy draft.

The light draft horses are generally spoken of as chunks and range in weight from 1,200 to 1,400 pounds. The light draft horses are the cheapest grade of draft horses and are bought largely for city delivery wagons, city express and omnibus work. The medium drafters are smaller and more active than the heavy draft horses. They range in weight from 1,400 to 1,600 pounds. These horses are especially adapted to express companies and artillery and are generally sold readily at a good figure.

The heavy draft are purchased for slow, heavy work. It is weight and a conformation for great strength, combined with good feet and legs and a substantial appearance, that are important in this class of horses and that make the brewers, the packers and various manufacturing concerns willing to pay long prices for them. They must weigh from 1,600 to 2,000 pounds. Quality remaining the same, the price varies directly with the weight, $25 to $50 value being added to each 100 pounds added weight.

Horses of the draft type have been selling during the past year for from $100 to $450 each.

Col. Cooper, one of the principal dealers in horses at Chicago, recently said that "The export trade is a great factor in the horse markets of today, but our growing American cities are a greater factor." He is also authority for the statement that of the 115,000 horses marketed in Chicago last year, 40 per cent were draft horses.

We can see by this that the draft horse is the great American market horse.

The coach horse type commands the highest price in the market, strictly first-class ones bringing anywhere from $200 to $2,000. Coach horses must not only weigh from 1,200 to 1,400 pounds, but they must be stylish and handsome in form and good high actors. It is a question here of style and carriage, combined with substance, rather than extreme speed. The coach horse, to be a desirable coach horse, must have considerable spirit.

The market never has been and probably never will be overstocked with high class coach horses. Besides the home market in our large cities, there is a strong foreign demand for this grade of stock.

The Cob or Hackney type is a small size coach horse, being if anything a little less rangy in build, but possessing beauty in form, high action and graceful carriage.

Roadsters.—It has been stated that 20 per cent of the horses reaching our markets are of the roadster class; the supply of the ordinary kind is plentiful, while the good ones quickly change hands. Prices range from $60 up, according to quality. To belong to the roadster type a horse must weigh from 800 to 1,000 pounds, showing good roading qualities. Saddle horses are sought for cavalry purposes and for those who enjoy the luxury of horseback riding on a gaited saddler. These horses are about 15.2 hands and slender of body and limb, but very handsome and graceful. They are trained to go the various saddle gaits. After they have received such training they bring from $100 to $300.

It will be seen by the above that there is a demand for a good grade of several types of horses. A demand which makes it possible to raise all

these types profitably under certain conditions. It is a pertinent question, then, whether the farmer can raise, equally well, all of these various types of horses, and can decide which type he will breed by mere personal preference.

Let us see. We are considering this question from the farmer's standpoint, not the breeder's. The farmer has many other matters which absorb much of his time and attention. Horse breeding is not his specialty. He perhaps could do better than he does had he time to devote to it. It would be our judgment, therefore, that the farmer is unwise to attempt to breed any type of horses, the market value of which depends largely upon training and development. Under this head we would class the American trotter bred for racing purposes, the gaited saddler, and a large part of our coach horses.

About the only horse that can be raised by the farmer without the aid of a skillful horseman is the draft horse. To be sure, he may raise the roadster and the coach horse to good advantage, provided he is a horseman and knows how to select and mate his breeding stock and has a good knowledge of handling light harness horses. His chances for success, however, are far more limited than they are in breeding heavy horses.

The present call for range horses as farm horses indicates a great shortage in farm horses. Farmers in the West and Middle West are buying range yearlings and maturing them on the farm. This indicates that there will be a market for light draft horses that are not suitable for market purposes on the farms. But some one may say, I do not want to produce a heavy draft horse for my own use on the farm. That is very true; you do not. The farmer must first make up his mind whether he is raising horses for his own use or for the market. If for his own use then he should breed exactly what he wants. If for market purposes what the market demands. We believe the farmer can do better than raise horses intended for his own use, and that by striving to produce a market horse.

If the breeding of the draft horse type is best calculated to bring to the farmer a profit, the next question is, how is he to produce that type. He cannot do it by haphazard methods nor by using inferior breeding stock, he must look well to the selection of mare and horse.

We believe the majority of the work on our Michigan farms can be and should be done by mares.

These mares should be good enough to breed market draft horses. We appreciate the fact that most farmers object both to heavy horses for farm work and attempting to breed colts and work mares at the same time. It is true that 1,600 to 1,800 pound mares would be unprofitable as farm horses, but it is not necessary to have mares of that weight to get very satisfactory draft horses for the market.

Mares weighing from 1,300 to 1,500 pounds can be used for farm work without serious inconvenience or loss, and mares of these weights when bred to a heavy stallion will produce market drafters of a type that will find ready sale.

Nor should we waste too much sympathy on the poor old mare that must do double duty by working and raising a foal.

If she is carefully worked and liberally fed she can do both with as little harm to her as the city street horse that must work every day

throughout the year and in all kinds of weather. We seldom think that we are cruel to the cow that breeds a calf and whose energies are drawn upon to produce several times the amount of nourishment that the calf would require.

The very fact that the farmer is situated so that he can make profitable use of the labor which can as well be performed by the colts and breeding stock, gives him a great advantage over the horse breeder who must allow his brood mares to run idle and make a business of exercising the young things.

If we may be allowed to suggest a point which is not altogether in line with the thought of this paper we would say, that one of the great leaks upon our Michigan farmers in the past has been the wintering in idleness a large number of horses, that the grain crops might be put out, cultivated and harvested, to winter through a lot of unprofitable horses to the next growing season.

We say, let these horses, if they must be idle, be good brood mares, and then they will return a profit instead of being a leak to the economy of the farm.

Unfortunately the brood mare question is not the only one with which we as farmers have to contend.

The question of a suitable sire is a grave one.

On the average, we are not good judges of horses, and we know little of pedigreed sires. The farmer cannot know everything and he most often knows least about horses.

We believe, therefore, that if in some way the farmer could have a guarantee that the stallion he is using is good in form and breeding, it would be a great help to him as a horse producer. The most feasible way to bring this about is to have government inspection of stallions. No stallion should be allowed to stand in this country that could not pass a careful inspection by some expert inspector. Those that could should be given a licence. The result of this line of procedure would, it seems to me, drive out in a very short time the majority of our poor, inferior sires.

As a last word, let me say:

1. Geldings are in better demand than mares. Sell the geldings and use the mares for work and breeding purposes.
2. Whatever type you raise, breed for quality as well as size.
3. Keep in close touch with our great horse markets and study the demands of the market.

Breed for the market; the horse which you would like best for your own use may not sell well in the market.

4. Work for government inspection of stallions.
5. Have a definite aim in breeding, and let that aim be to produce the best grade of some one of the established types.

SUGGESTIONS AS TO SOME OF THE RECENT DISEASES OF LIVE STOCK, AND REMEDIES.

DR. G. A. WATERMAN, AGRICULTURAL COLLEGE.

Mr. Chairman, Ladies and Gentlemen:

The topic assigned me for this afternoon, "Suggestions as to Some of the Recent Diseases of Live Stock, and Remedies," might lead you to think that you were to hear of something entirely new. This, however, is not the case, as I shall discuss diseases that have existed for a long time, and perhaps the remedies which I shall suggest will not be new to a great many of you.

The first disease which I wish to speak about is hog cholera. I doubt very much if true hog cholera is very prevalent in Michigan; there is, however, a swine disorder, or perhaps disorders, which is contagious in its nature and which resembles in many respects hog cholera, and which needs the same treatment so far as preventive measures are concerned, and the suggestions which I shall offer will be along this line of prevention, because up to the present time the curative lines of treatment to a very great extent are failures. The contagious diseases among the lower animals must be combated in the same manner as are the contagious diseases affecting the human family, the same as scarlet fever and smallpox, by strict quarantine regulations. In the case of these swine disorders, the affected drove should be quarantined, no outsiders allowed to visit it, and the attendant not allowed to visit other droves. Instead of trying to conceal the fact that a contagious disease exists on the farm, a sign to the effect that such a disease does exist should be posted so that stock owners may take the necessary precautions with regard to their own animals. All animals that die should be buried deeply, or better, burn the carcasses rather than draw them into the woods and leave them lying where the wild animals, birds and dogs may get at them and thus scatter broadcast throughout the community the germs of the disease. If there is an outbreak of hog cholera, or a similar disease in the neighborhood, it is advisable for the owner of swine, if he has a large drove, to separate it into smaller droves, and to keep these as far apart as is practicable; keep them in comparatively small enclosures, but keep the quarters clean. If allowed the run of a large field the chances for the contraction of the disease, by dogs, small wild animals or birds, carrying the infection from a carcass carelessly left without proper care, are very great. The small enclosure reduces this, one of the principal sources of infection, to a minimum. If it so happens that one of the animals becomes affected, remove the healthy to new quarters at once, after removing from them all the dirt possible by washing. Leave the diseased where it is. Here again the small enclosure is an advantage, as the area infected is small, and the work of disinfecting is very much lessened. To disinfect, burn all litter and material of little value; wash the interior of the building and the fence surrounding the enclosure with a solution of corrosive sublimate, one part to one thousand parts of water—corrosive sublimate one ounce,

water eight gallons—bearing in mind that this solution is a deadly poison, hence requiring care in its use. It must also be kept in wooden buckets, afterwards whitewashed. A little precaution along preventive lines will do much toward holding in check the spread of these contagious diseases. Treatment, other than good care, the giving of a tonic, and the use, perhaps, of a little carbolic acid, is of little value.

Another disease I wish to speak about at this time is a parasitic disease affecting sheep, caused by the stomach worm, as it is commonly called. This disease, in some parts of the State, is causing a great deal of disturbance. It affects lambs most often, although older sheep are not exempt. The lamb manifests the symptoms of the disease throughout the fall and winter. The symptom first noticed is general unthriftiness; the lamb is not doing as well as others of the flock, although it may appear bright and eat well. If the worms which cause the disease are not present in too great numbers, this unthriftiness may be the only symptom noticed; if, however, the worms are present in large numbers, the animal will become poorer and poorer, get weaker and weaker, lose its appetite and finally die. In many cases a persistent diarrhoea sets in and hastens the ultimate termination. A post mortem diagnoses the disease for a certainty, and we find in the fourth stomach the little worms which are the cause of the trouble. These little worms are about an inch in length, generally of a reddish color and somewhat twisted. In severe cases they are present in great numbers, forming at times a squirming mass; in less severe cases they are found distributed over the membrane lining the stomach.

The old line of treatment for this disease, and the one that is still used by many is turpentine. One ounce of turpentine is thoroughly mixed with sixteen ounces of milk, and from two to four ounces of this mixture is given at a dose. The dose is repeated each second or third day until four or five doses have been given. Gasoline has also been recommended; it is given in the same manner, the dose being a little less. Santonin is considered of some value, the dose is from two to five grains for the lamb. It is practically insoluble in water, but may be given in thin gruel; give once a day for a week or more. Sulphate of iron is of value in removing worms, and aside from this action is an excellent tonic and hence valuable to use at this time. It may be given along with the grain; an ounce of finely pulverized sulphate of iron thoroughly mixed with a grain ration of moistened oats or bran would be about the amount for thirty lambs; it can be given once, or even twice, a day, for two or three weeks, or longer if conditions favor it.

Preventive measures are of great value in keeping a flock free from these parasitic diseases. The flock should not be confined to the same pasture continuously. Water supplied from troughs is much better than that from pools, inasmuch as the water from pools is apt to contain the eggs or larvae of these parasites. Close grazing also tends to facilitate infection.

It would be to the advantage of the flock owner to post mortem all sheep that die from any cause, for the purpose of determining their condition with reference to internal parasites. If a number were thus found to be free from internal parasites, he might with a good degree of safety suppose the flock to be comparatively free, while if parasites were found to be present in considerable numbers, he might safely conclude that measures should be taken to rid the flock of the pests.

Another parasitic disease which is affecting the sheep of the State to an alarming extent is the one known as nodular disease. This disease is characterized by the formation in the wall of the intestine of nodules, which vary in size from a pin head to a large pea. They contain a greenish cheesy mass. These nodules are found in small numbers in the great majority of sheep; it is only when present in sufficient numbers to cause inflammation or to interfere with the function of digestion that they cause trouble. The nodules are caused by the larva of a small worm; the adult worm is a little white creature about an inch in length, which takes up its abode in the intestines, more especially the large intestine. The life history of this parasite is something as follows: the sheep takes in, along with its food or drink, the eggs or larva of the parasite; the larva, upon reaching the large intestine, burrow into its wall and there remain for a period of their existence, causing the nodules which are characteristic of the disease. The larva, after remaining in the nodules for a time, return to the interior of the intestine and there complete their development. In this disease it is not the adult worm, but the larva, which causes the difficulty. Curative treatment in this disease is of no use, inasmuch as no medicine will act upon the larva in the nodule. The preventive measure is to keep the flock free from the adult worms. This can be done by the same measures as were recommended for the previous disease. The suggestion with reference to the post mortems is especially applicable in this disease. The symptoms of the disease are about the same as those of the preceding disease; it needs the post mortem examination to diagnose it for a certainty. This disease effects older sheep more than it does lambs.

The next and last question which I wish to discuss at this time is a comparatively new treatment for milk fever, known as the Schmidt treatment. My reason for discussing this at this time is, that we see a good deal written about it now in our dairy papers, and there are a few points in its use which should be thoroughly understood and carefully carried out. The disease itself is too familiar to all dairymen to need discussion at this time, and hence I will confine my remarks entirely to the treatment.

The Schmidt treatment was first used and recommended by Dr. Schmidt of Denmark. It is based upon the supposition that the cause of the disease is the production in the udder of a poison. The treatment is intended to neutralize the poison or to prevent its formation, and consists in introducing into the udder a solution of the iodide of potash. The principal point in connection with its use is to see that no particles of dirt, and especially to guard against any germs, being introduced along with the solution. The necessary equipment in order to successfully administer the treatment is, aside from the drug, a quart bottle, with cork; two feet of small rubber tubing, a small glass funnel, a milking tube, a quart of a three per cent solution of carbolic acid (an ounce of carbolic acid to a quart of water) and two dishes. Put one-half of the carbolic acid solution into each of the dishes; put the funnel into one end of the rubber tubing and attach the milking tube to the other end; place these in one of the dishes containing the carbolic acid solution and see that they are thoroughly wet with it. Rinse out the quart bottle with a little of the carbolic acid and then put into it two

drachms of the iodide of potash and fill it with water that has been recently boiled, pouring the water directly from the teakettle into the bottle; cork the bottle and cool the solution to a temperature of about 100 degrees, or about the temperature of milk. The solution is now ready to be introduced into the udder.

Remove all the milk possible from the gland, brush off the udder and flanks, and if the cow is down place a clean cloth under the udder; wash off one of the teats with the carbolic acid solution from the dish not containing the funnel and tubes; wash the hands in the solution, and then introduce the milking tube (after allowing all the carbolic solution to escape from it) into the teat and elevate the funnel. Have an assistant wash off the mouth of the bottle containing the potash solution with the carbolic solution; remove the cork and pour into the funnel one-fourth of the iodide solution, allowing the funnel to become empty once or twice, so as to allow some air to enter. Treat the other three teats in the same manner, being careful to use the carbolic solution freely on the teats, funnel, tubes and mouth of the bottle. The great danger in the use of this treatment is in the introduction of germs or dirt, which will later cause inflammation of the udder, hence the great caution necessary in using the carbolic solution freely and in having all utensils scrupulously clean. After all the solution has been introduced knead the gland thoroughly, but gently. Do not milk out the solution for six or eight hours, or until it becomes necessary to milk the animal. If there is no improvement in the course of six or eight hours the udder may again be emptied and another solution of the same amount may be introduced in the same manner. A third solution may be used if necessary in the course of another eight or ten hours.

The Schmidt treatment has thus far proved the most satisfactory of any treatment that has ever been recommended for milk fever, but inasmuch as complications are apt to occur with the disease it is often necessary to use other lines of treatment along with it, and on this account it is always advisable when possible to secure the assistance of a qualified veterinarian. As it has not been my purpose at this time to discuss the general treatment for milk fever, but rather to confine my remarks to the Schmidt treatment, I will close at this point by thanking you for your kind attention.

WOMEN'S SECTION OF THE STATE ROUND-UP.

Mrs. Mary A. Mayo presided at all sessions.

Mrs. Mayo: This is our Fifth Annual Round-up Institute. At the hotel I met ladies from every quarter of our State, farmers' wives who have left their homes and home cares and have come down to this, our University City, to attend this meeting this afternoon, which we trust will be of benefit to us all. If twenty-five years ago someone had brought the program we have here this afternoon and placed it before us, and said that twenty-five years from now you, as farmers' wives, will come in a convention of your own, and there you will meet a dean from the Agricultural College—a lady; you will also meet a professor of sewing, what would our mothers and grandmothers have thought? They could hardly have believed it. But we have come this afternoon because we have been invited to come. The University of this city has asked us to come and meet with you. We are glad to come that we may know you better. There is not a farmer's wife in Michigan, loyal to the best interests of the State, whose heart does not go out to the University of Michigan. We are proud for what it has done for all the states of the Union.

HABIT AND MANNERS.

MISS MAUD R. KELLER, DEAN OF THE WOMEN'S DEPARTMENT, AGRICULTURAL COLLEGE, MICHIGAN.

The aims and efforts of the Women's Section of the Farmers' Institutes seem to be along ethical lines. The men's sections are discussing rotation of crops, cultivation of sugar beets, sheep raising, so-called "practical" subjects. The women are working toward social reforms, toward uplifting conditions and ideals. Their questions are how to right wrongs; how to make schools centers of learning—not facts only, but the learning and practicing of unselfishness, gentleness, of grounding children in ideas of right. With such aims before us, it is to our advantage to think for a while about the power of habit, its physical basis, the importance of attention to habit in children, the significance of the word manners and its connection with habit.

If we understand the physical basis of habit it will help us to understand why habits once formed are so strong; why it is as hard to break

a strong habit as it is to turn the direction of a stream of water that has once plowed its way through partly resisting earth.

Persons who know, the physiologists and the psychologists, say with authority that whatever we do is the result of some thought or idea. Now, the way we begin to get ideas and keep on getting them is through the senses. Something that may be perceived by the sense of sight is before us; what happens? The little nerves carry the message to the brain, and that is not the end, some action follows; if it is lightning that we see we may start or scream, or apparently do nothing, yet these authorities assure us that it is not possible for us to perceive anything without some result in action, if it be no more than a tension of the muscles or a quickening of the blood. There must be some result, and the explanation is this: These nerves, carrying messages to the brain, deposit them there; it is like carrying and emptying water on a surface not fixed and hard; the water finds a way out, and in doing so makes a little track across the plastic earth. It is the same with the messages to the brain; they find a way out, they make a path just as the stream does. Go a step farther; you know how water, finding an outlet once in a certain direction, is likely to take the same path next time it is emptied in the same place; it will run off in its old track.

This is not a figure of speech. The process in the brain is exactly the same. My sense of sight may show me an orange that does not belong to me. The little nerves carry the message to the brain, and then comes the action. I may take the orange; I may leave it. Whichever I do is recorded in the path which my decision took over the soft matter of the brain. The next time a similar message is carried to the brain it is more than likely that it will pass out into action through the same channel that was plowed beforehand.

Clothes after a while fall in the same folds, gloves keep a certain shape, and the material of the brain has this same characteristic of keeping the form once given to it.

This helps us to see why it is hard to break old habits. We may wish a stream were flowing in some direction other than through our field, but it is an almost hopeless task to turn it from the old worn bed. We may wish our habits or our children's habits went in some other direction, but if they are of long standing we have to work hard to form a new channel or pathway of action.

We usually mean bad habits when we use the word habit; but this is a mistake. Our virtues are habits, just as our vices are habits. Acts of courage, of resistance of evil, form their pathway through the brain just as much as any other acts. We are all a mass of habits; our nervous systems have grown in the way in which we have made them grow—"just as a sheet of paper or a coat once folded tends to fall forever into the same folds."

Dressing, eating, walking, are habitual acts. We can scarcely remember when we first learned to brush our hair. We know how young children struggle over buttoning clothes; probably we all struggled in the same way. But we don't now! We are now "so in the habit." We talk on important topics while we automatically put out the light or unlock the door. The higher thought need not be bothered about these lesser things.

Now, what has this discussion of habit to do with the Women's Sec-

tion? We have answered when we have decided whether habit is of practical value or not.

It simplifies life by saving power; is that of practical value? It makes life more forceful, because it diminishes effort over minor things and allows that energy to be given to more important affairs. In general, the study of habit is worth while to women, because women carry on the work of creation and of instruction, because women are responsible for the habits of the world.

A German writer says that a child, even from its birth, should be accustomed to cleanliness and neatness; physical cleanliness is followed by mental and spiritual cleanliness. Spencer says: "Dirt is usually accompanied by an inclination toward crime; cleanliness creates a fancy for order and regularity in general."

What we are to be must begin in childhood, else we spend half our energy in overcoming habits formed in childhood if we wish to be other than what we began to be in our homes. It is worth our thought to see to it that children shall have a good inheritance, but it is beyond our power to change facts three generations back. Our work is today and for the future; inherited tendencies that may be vicious we have to fight in ourselves, in children. We have to see to it that these tendencies do not become habits.

There is a picture that illustrates one of the aims of the Women's Section as well as this talk on habit. An old man is stepping upon a serpent and keeping it down by main force; a young man, his son, is there, bravery, courage and fearlessness are in his face; a mother holds the grandson, a boy of fine face, strong body, an ideal child. The old man is fighting the evil in his nature; he feels it writhe under foot; he can never stop fighting it; as a result, his son inherits as brain instincts his father's determination to conquer the base that was in him. The third generation enters life with freedom from inherited evil. The old man's habit of fighting his own weakness gave positive bravery to the second generation.

The Duke of Wellington said: "Habit is ten times nature." Suppose the child's or our own nature is not what we would have it, mould it through habit. "Make the child's nervous system its helper instead of its enemy." Help children to overcome habits of indecision; help them to form habits of practical usefulness. The more a child can give over to be done by habit the more time and energy it may spend on higher things. Things we do by habit need no waste of energy. We copy our past selves. We are told that at thirty our habits are crystallized.

Never be content to teach children maxims. Teach them to carry out into action their good ideas. Each time an action is the result of a noble idea a furrow is plowed through the brain, over which a similar good action may be repeated. If you have a head full of lofty sentiments and have not put these into practice, your character will not grow better.

" A good man was there of religion,
And he was a poor parson of a town.
Christ's love and His apostles twelve
He taught, but first he followed it himself,"

says Chaucer. First we must follow it ourselves. The actions are

what give the new set to the character and work the good habits into the very fibre and tissue of the brain.

Rip Van Winkle's behavior is what set his habits. Professor James calls our attention to the drunken Rip, who, each time he yields and drinks, says, "I won't count this time." And we pity him and do not want to count it—a kind Heaven may not count it, but it is being counted. Down among his nerve cells and fibres the molecules are counting it and registering and storing it up to be used against him when the next temptation comes.

Paths of right conduct may be plowed through the brain; habits of decision, of fearlessness, endurance, forbearance, truthfulness, courtesy, humility, may be formed. How do we give evidence that we possess these habits?

Here is the connection between habit and manners. Our manners are simply the outward expression of our habits, at the same time they are strengthening our habits.

Habits of carelessness or punctuality, habits of control or lack of control, of respectfulness or irreverence, all are shown by our manners.

Manners is a good word and should mean more than mere externals. We need to pay attention to the habits and to the manners of children and young people.

We hear that habits of disrespect, of discourtesy, are characteristic of the youth of today; that good manners in children is a thing of the past. Surely women are forgetting a part of their work if this is true. We must realize the tyranny of habit through a comprehension of the method by which habits grow strong. We must devise ways by which children may strengthen good habits; we must not be indifferent to the behavior of children; we must see to it that acts of anger, discourtesy, untruthfulness, are never repeated. This will take wonderful tact. We must in our own characters meet a high requirement, because women must keep on forming the habits and moulding the behavior of the world.

DISCUSSION.

Mrs. Mayo: How old do you think a child should be before its habits begin to be formed?

Miss Kellar: I do not know as much about that as you do. I am very much interested in a baby six months old, and it has some well formed habits already.

Voice: Should begin 200 years before it is born.

Voice: We might be preparing for those to be born 200 years hence.

Mrs. Mayo: I am of the opinion that a good many of us mothers and fathers do not give enough attention to our young children. For instance, I have seen children running out of rooms, crowding older people; but the fault is not that of the children, they are not taught any better. I do not think the child that is let alone is the one that has a good time.

Mrs. Haner: I think every mother who has watched her own children from the earliest signs of activity will know that then they were beginning to form their habits. We should begin to form good habits when they are yet babies, for the character is surely then beginning to be formed—and as the beginning, so the finishing.

Voice: I fully endorse what Mrs. Haner has said. I think as soon as the child is laid in our hands is the time to begin forming its habits. We can look back and think we will not do so and so, but we find we are doing it, and must change our mind and then form habits as soon as it is laid in our hands for the future of that child.

Mrs. Mayo: I thought when Miss Kellar was speaking of the water running over

the ground and wearing a little deeper each time that it illustrates what we speak of as getting into the ruts—running along in the same groove—and when we have worn them deep how hard it is to get out.

SEWING IN RELATION TO THE HOME.

MRS. J. L. K. HANER, INSTRUCTOR IN SEWING, AGRICULTURAL COLLEGE, MICHIGAN.

The subject of Domestic Art, which means sewing and its closely allied subjects—dressmaking, millinery and art needle-work—has a two-fold value—the utilitarial and the educational. Neither of these should be neglected at the sacrifice of the other, and this is the aim of sewing as taught in our schools and colleges today.

It is gratifying to look back over the last few years and note the changes of practical work, which have been brought about by the earnest and continued efforts of industrial education. The work from its educational point of view, or as a phase of manual training in high schools, industrial schools and normal training schools, has attained a wonderful proportion, and kept good pace with the great strides made by other various phases of practical training. The supervisor of sewing in the public schools of New York City says: "I have under my supervision 48 departments, 24 special teachers, 275 classes a week, with about 10,500 children." As we consider the same work done in other localities, we find it indeed difficult to imagine the benefits derived from all this effort, as it reaches almost wholly back upon the homes of our country.

Knowledge is power, and power taken into the home, the basis of the great social structure of a nation, and made to apply to even the simplest necessities of home life, is a wonderful power and must be cultivated and enlarged in all possible ways, and one of the greatest opportunities is to make the knowledge of sewing a power to be felt in every home in the land. Mothers make such a mistake who train their daughters to do nothing, slaving for them, and what is the result? Hampered at every point by this foolish bringing up, they are incompetent to discharge the burdens which life may have in store.

You may say that manufactured articles of wearing apparel make good this deficiency or lack of knowledge in the home, but who does not appreciate a home-made article better, and who does not know that it does wear longer? If it is best to train the child along aesthetic lines in any phase of art, then let him be trained to appreciate and prefer a piece of true art in needle-work, even plain sewing, over a wholesale manufactured article which may be bought at cheap rates. Let me illustrate by a school girl's sewing apron, neatly though plainly made, hand-sewed by herself, and appreciated because she wove into its very stitches her own power and love of doing a thing for herself, and, too, having done it the best she could, over a very elaborate one selected from a whole boxful in a store marked "your choice for 10c." As aesthetic development and culture help to make a person a better person, so sewing can be made to help a girl to become a better girl and a more powerful and valuable woman to society.

Certainly we do not need to question its value from a financial point of view. The cost of being unable to do the plain sewing in the home always averages more than the value of the materials used. I am certain that in the majority of the homes of our country a trained knowledge of sewing would keep the family above the abject poverty of too many instances and place them into a thrift and industry which would meet the common needs of wholesome, plain living.

How can we have a better knowledge of sewing in the home? We might recommend a number of ways, such as introducing into the homes some of the carefully prepared manuals or some of the sampler books put out by manual training institutions, perfectly illustrating the various stitches, these the mother might put into the hands of her daughters to aid her own instruction. But in many cases the mother would be obliged to take them first into her own hands for instruction, and this would go beyond the time and patience of the average mother. So I see no other way than the one generally adopted—the method by which to train the young mind to become strong and efficient in any or all needful things of life—the educational system used in our schools and colleges. This is the only means of reaching the homes of our country. The educational advantages are certainly the greatest means by which to benefit, lastingly, the children of our homes—which will do for them what the busy or incompetent mother's lives cannot give to them; which will make their struggles easier, perhaps, to them as they take their places in life. Why not use them? Why not send the children to the sewing school and the cooking school and learn how to do the work of the home? Let the young woman study the profession of housekeeping and home-making, as a young man studies and learns his vocation or profession, and as she learns how to do it, the drudgery ceases and she finds pleasure and profit in doing it. She comes to realize the value of the home, its sacredness, and that it is the great center of social, political and religious activity, out of which may come health, happiness and prosperity, instead of poverty, sickness and degradation.

Thus, through Domestic Art, as taught in our schools and colleges, sewing is made the most practical instruction in our homes, and as the young woman leaves her school life to launch out into the great arena of earnest, active reality, of which her school days were only a prophecy, she is the more able to meet the needs of her own home, and prove the power of knowledge and understanding, the energy and healthfulness of industrial education; even that morality and religion are built upon wise industry.

DISCUSSION.

Voice: I would like to ask if there is extra charge at the Agricultural College for this instruction in sewing, and who furnishes the materials to be used?

Mrs. Haner: The material for the work as far as the samplers are concerned is furnished by the department. For the garments the material is furnished by themselves and then they have them for their own. In the entire work, most of the material is furnished by themselves, but we get them in such a way that the cost is very light. There is no fee in the department.

Mrs. Mayo: Is the work optional with the young ladies?

Mrs. Haner: It is required, with the exception of art needlework—that has been made a senior elective. Nearly all will prefer to take it, but mostly the special students.

Voice: I would like to ask if you think it quite essential that girls should be taught hand work before they sew on the machine?

Mrs. Haner: I feel that hand work lays the foundation for the higher art of sewing. It is necessary to do the thing by hand to get the best in mind. While there are girls who can sew well on the machine who know nothing about hand work, I feel it is not the best way for them to do.

Voice: Do the girls at the College work entirely on ladies' garments, or do they do other sewing as well?

Mrs. Haner: The only time we have to give to garment making is making them for themselves, because they take their own measures, cut their own patterns, etc.

Voice: Do you lay much stress on making buttonholes and sewing on buttons properly?

Mrs. Haner: Yes: the most time given to any one sampler is to the buttonhole sampler. There is six hours, for instance, given to the sampler on buttonholes.

Miss Keller: I would like to say that one of our girls came to me last year and said, "It is impossible to get out of making buttonholes under Mrs. Haner." So you can see there is much attention given to this feature.

SCHOOL HYGIENE.

DR. ELIZA MOSHER, ANN ARBOR, MICHIGAN.

At the annual meeting of the Federation of Women's Clubs, held at Jackson, Mich., November 1st, 2d and 3d, 1899, a report was read, which was prepared by a joint committee from this Federation and the Collegiate Alumnæ Association. Among other things the committee recommended that "A more comprehensive and practical knowledge of school hygiene be included in the requirements for a teacher's diploma."

In view of this recommendation, and because the subject of school hygiene seems to be more or less vague in the minds of both educators and parents, the chairman of that committee (Dr. Eliza M. Mosher) prepared an outline of the subject of school hygiene, which it is hoped will serve as a starting point at least for a widespread consideration of this subject. This outline was printed in the February number of the "Interchange," the official publication of the Michigan Federation of Women's Clubs.

No one can question the importance of such knowledge on the part of teachers, and yet without the intelligent co-operation of parents equally well informed along these lines, they can do comparatively little with it in the schools. Such knowledge is essential to parents, first, that they may hygienically care for and train children of school age in the home, and, second, that they may have a clear and practical conception of the conditions which should surround their children when in school, as well as of the care which should be given them by the instructors to whom they intrust them during the most important developmental period of life.

Parents have ever felt solicitude upon these subjects, but this solicitude, it must be confessed, is often without value because of a lack of knowledge of the remedy for the ills they perceived and deplored. Again, knowledge of school hygiene must become universal to be of great utility. This age is one pre-eminently of co-operation. The individual who stands alone is practically a cypher. An army of individuals moving in

the same direction, shoulder to shoulder, has power to sweep all obstacles out of the way.

It is with the hope that in Michigan at least a more concentrated action between parents, educators, school boards and taxpayers may be stimulated that the author is endeavoring to bring this subject of school hygiene forward at the present time.

The limited time which can be given to one topic in a meeting like this, prevents even a superficial consideration of the great subject of school hygiene. I shall, therefore, limit myself to some points only of the outline printed in the Interchange, and as the personal hygiene of school children must largely be looked after in the home, and provided for by those who construct and furnish school buildings, I shall limit my consideration of the subject to some important points under that head.

The topics under the head of personal hygiene are:

1. Food.
2. Exercise.
3. Rest.
4. Cleanliness of body and clothing.
5. Clothing.
6. Care of the eyes.
7. Habits of posture.
8. Bad moral habits.
9. Diseases and conditions common to school children.

Under the first head, foods, I shall speak of but two things, (1) the importance of cooking food substances containing starch a longer time than has heretofore been the custom, and (2) the importance of giving to growing children the four foodstuffs—proteid (including meat, eggs, milk and grains), fat, starch and sugar in the proportion demanded by the body. It is uneconomic to eat partially cooked starch, for it is not absorbed, but wasted, and vital energy, which is needed for useful work, is used up in removing it from the body. Our bread should be baked longer and our cereals more carefully cooked than these commonly have been. Children need the elements derived from starch to feed their furnace fires, and they should be able to utilize every grain swallowed.

Proteid food is the great tissue building material of the body. The flesh of cattle and sheep contains this precious building material in most concentrated and digestible form; eggs and milk next, dried peas and beans, and grains last. The child is growing during his school years, often very rapidly, and he needs these elements out of which to build bone and muscle. Be sure he has them, but not in too large amounts, as the surplus gets out of the body only at a serious cost to its machinery.

Childhood is the only truly active stage of earthly existence. Awake and asleep the child's mind and body are responding to each other continually, and this involves the expenditure of force and energy. What is the source of supply of this energy so invisibly expended? The three food substances, fats, starches and sugars mainly; proteids also add their share, but it is uneconomic to use them for this purpose.

How much and in what proportion should children partake of these foods? The quantity depends on many things—the size of the individual, rate of growth, activity of body cells, heredity, etc. This question has to be settled individually. The proportion of food substances re-

quired varies somewhat also, but within narrower limits. A simple way of getting at it roughly would be to divide the food for a sample day in ten parts; of these one should be fat, two proteid and the remainder starch and sugar. In tabulated form this would be:

Fat	1
Proteid	2
Starch and sugar	7
	10

It is well to decide upon the amount of proteid and fat with care, allowing the child to "fill up" with the less harmful substance, starch, in the form of bread and grains. Mothers have usually thus looked after their children's food, and yet do we not all remember the ravening hunger from which we suffered as growing children? If these four food substances well cooked, in right proportions and in necessary amount, had been given us each day, it is fairly safe to say we should not have suffered thus. The well-fed child becomes reasonably and actively hungry, but not painfully so. His body cells do not cry out in agony for food, because they are not starved.

One word more must be said before leaving the subject of foods, and that is in reference to the importance of the free use of water as a beverage. The body is three-quarters water. It is always losing it in large amounts. It can become accustomed to conducting its work with a meagre supply of water, but it cannot do it economically without one or two quarts a day, taken between meals. The beer of the German, and the light wine which the French drink, supplies the body with water, and it finds it easier to get rid of the harmful constituents than to get on without the water. We in America should be wiser than they and take the water without its harmful adjuncts. We might then be as strong as our beer and wine drinking neighbors, "other things being equal."

CLEANLINESS OF BODY AND CLOTHING.

It should not be necessary in this last part of the nineteenth century to say anything about the importance to the child's physical nature of a clean skin, nor of the value to his moral nature of clean clothing outside and beneath the surface.

We live, however, by standards, and our standard in America of personal cleanliness is without doubt too low. For instance, the mass of home-makers today have a notion, derived probably from ancestors who carried water for drinking and domestic purposes half a mile or so, from a town well, that a full bath once a week is enough for a child, if his face and hands are kept visibly clean. Now the fact is, that to keep a child's body even reasonably clean, he should, with his active skin pouring its waste out in an almost constant stream, be washed at least once a day completely. We should change our standard of cleanliness now we have good cisterns and hydrants pouring water without effort into utensils light and easy to carry, and with bath tubs even which make the transportation of water unnecessary.

The result will be stronger bodies and better smelling school rooms, fewer cases of contagious diseases and better morals.

CLOTHING.

One word at least must be said on this important subject. Children grow so rapidly it is almost impossible to keep them in clothes which are sufficiently roomy to prevent friction; certain delicate parts of the child's body should never be subjected to irritation of any kind, and whatever else a mother leaves undone she is inexcusable if she once puts on her child a pair of tight or starched or rough seamed drawers or trousers.

Will the time ever come when the mothers of Michigan will refuse to have their little daughters subjected to the temptation to build up wrong ideals of dress through the example of dear teachers with corseted waists, high heeled shoes, and uncomfortable neckwear? Certainly not unless they as a class have higher ideals of dress themselves.

THE CARE OF THE EYES.

The large number of spectacled adults seen everywhere at the present time indicates that some common and far reaching cause is at work to produce defective vision. It is not needful to go beyond the home and the school to find this cause; insufficient nourishment during the years of growth and development, bad air in sleeping room and schoolroom, the use of the eyes with the light directly in front of them in study at home; hanging the head over the books and thus producing more or less passive congestion of the eye region; over-use in near work, and failure to rest the eyes by often fixing them upon objects far distant; bad posture in school—all these and many more conditions which affect children unfavorably during school life, appear to be predisposing causes of eye defects. All these could be changed if parents and teachers and those who build and equip schools would work together with this object in view. The eyes of school children should be tested from time to time to ascertain their condition and needs.

HABITS OF POSTURE.

The influence of unhygienic posture of body upon school children is more far-reaching than is commonly believed to be the case.

At this time the body is almost like clay in its tendency to become moulded into the shape it most often assumes.

The school desks and seats in common use encourage bad postures in children; indeed, it would be impossible for a child to sit in them in a hygienic position, and write or read, many minutes.

The desk is too high to place the elbows on, and too low to support the book at the right focal distance from the eyes. The seat does not balance the body comfortably, nor does it give good support to the back. Opportunities to occupy good positions at home in study are not always what they should be, and many teachers do not sufficiently understand the mechanics of the body to properly train children in hygienic standing and sitting. Moreover, the long hours in school fatigue the child and make it tiresome to sit in any position. Better shaped seats and desks are needed in schools. Shorter hours of confinement indoors, and more careful physical training and exercise, to prevent the harm constantly being done to school children under the present regime.

Lastly, our schools should be under the care and direction of well trained physicians, who should have power to enforce such changes as should be made, as well as to discover and separate promptly such children as are affected with diseases and conditions unfavorable and dangerous to others.

DISCUSSION.

Mrs. Mayo: I wonder if the effect of our school teachers upon our sons is not quite as much as it is upon our daughters. I think the boys are influenced as well as the girls by the neatness of the teacher.

I am very glad that this question of foods—which is a question that you and I have thought over when our children were young, whether the foods were the best for them—has come up. And see what knowledge of the subject is being brought to the mothers of today! I heard a farmer's wife say she had raised a good many geese, and could feed a goose to perfection, but she did not know how to feed her boy and girl and her husband. I think children should be studied very carefully, and each given the particular foods they require. I am very glad this paper has been given by so good an authority as Dr. Mosher.

Voice: I should like to ask how early we should begin feeding children such foods as eggs, for instance.

Mrs. Scott: It seems to me that I began feeding my children the cereals when they were about a year old, and then gradually went on from that to the stronger foods. I do not know why eggs should not be good food when the child is a year old, or a little less.

Voice: I have known good results at ten months old when it was cooked very lightly, and then begin to take the eggs cooked a little harder until they can masticate with their teeth.

Voice: I think raw eggs could be fed to a child very young. Also to invalids. Milk, of course, is another good food.

Mrs. Mayo: We know that an egg contains all the elements that go to support life, and therefore it certainly is an excellent food, either for children or grown people.

Mrs. Scott: There is a good deal of talk about not eating meat, and depending altogether on the cereals, but we cannot in our homes cook the cereals enough so that they will take the place of meat. This is altogether owing to the fact that we do not cook them properly, for unless they are baked or cooked and cooked again it is impossible for them to take the place of meat.

Voice: I would like to speak about the use of nuts in the place of meats. I know of a boy who has always been very delicate, and it was almost impossible for him to eat any amount of meat, but by giving him the nut butter he is very much better.

Voice: What is the effect of too much sugar for children?

Dr. Worden: I have hardly known of a case where children were fed too much sugar. We all need a certain amount of sugar, though, of course, it can be overdone.

Voice: Is condensed milk proper food for an infant?

Voice: Some would think it was not good food for an infant because the milk is from so many cows. This may be true in some cases. There is also another objection: the condensed milk is very sweet, containing a large amount of sugar, which fattens the child, causing it to appear to be healthy, but in case of sickness the child fed on condensed milk as a rule does not seem to have much strength to pull through the sick spell. Still, there are cases where condensed milk can be fed to infants where nothing else seems to agree with them.

THE WELL-BRED CHILD.

MRS. MARY A. MAYO, BATTLE CREEK, MICHIGAN.

It is evident that marriage was primarily founded that the race might be perpetuated, and the preservation of the race, which is the child, is the duty not only of the family, but of the state.

True marriage is the life union of one man and one woman who are in suitable condition of mind, body, disposition, tastes, development and age, to permit them to live together in happy, healthful relations for the purpose of founding a home and rearing a family. And the solemn obligation to do so is affirmed by each in the name of the Father, the Son and the Holy Ghost, and this tie between them should last until death severs it. Marriage can mean no more, for under these conditions the highest possible standard of marriage may be reached. It must mean no less, for less would make of this most solemn and fearful responsibility but a total failure, and failure here means untold misery not only for this one union and this one family, but misery for generations yet to be. The first obligation of men and women as partners in marriage, for it is a partnership, and if either shirks responsibility, the child, the home, the result of marriage, must suffer in like proportions, is to prepare themselves to become parents; to give to the child yet to be the best possible conditions in order that it may be of the highest type. We recognize the fact that marriage has secondary considerations, as that of companionship, helpfulness, etc., but today we are dealing with its primary object—the child. For no other office in life do men and women need more careful and thorough training, not the training of a few months or years, but the training of a lifetime. In fact, the life thought of every parent should be: what can I do or be that my children and my children's children may be well bred. My child must be just as wise, good, beautiful and happy as he is capable of being, and his capabilities must be of the highest. What can I do or achieve in order that the child that may be mine shall be of the highest type, in the likeness and image of his God, and but little less than the angels. A perfect organization and perfect development is the inherited right of every child. It is its greatest inheritance to be well bred, well born, and to be welcome at birth because it is desired and not because of a mere chance, as gratification of passion that compelled it to be. Parents are not living today for the children, but for the race and for all coming time. The principles we make ours today, the practices we pursue, the lives we live, the thoughts we think, leave their mark on the race as long as time endures, and who shall say that they do not reach over and touch the border of that land that we term eternity. We say that thoughts are living things. They are seeds and we live with them, and not only ourselves but our thoughts are the foundation of the character of the child that is coming. All improvement is the result of effort. Nothing happens. If it is wise and best that the child shall be well bred, this means advancement and it must be the result of human efforts. Man's power to enlarge, develop, strengthen and improve the vegetable and animal world is not ques-

tioned. To it he gives thought, study, work and money. Frequently men and women are more diligent to get a healthy crop of potatoes, and wheat of the largest berry, apples that bear to the fullest all of sunshine, aroma and lusciousness, free from blotch, speck or worm; herds that shall be of the highest type; to this the service of years are given, books are written, rules laid down, arguments and facts presented that do insure definite results; the child alone is neglected; its nature left to be regenerated by God. If more thought, study and care were given to generation, there would be less need of regeneration. There is a cry of anguish going up all about us. It is the cry of the child of the past who is the man of today. We hear it as he reels from saloon doors, in the moans of humanity who have had as their heritage diseased bodies and minds. We hear it in the sentence of guilty that falls from jurors' lips, because there were tares sown instead of wheat by its ancestry. We hear it in the voice of her whose wages are death, because her father was a libertine, and we who are holier than those pass by on the other side, pronouncing sentence, not knowing how fierce was the struggle, and that she failed because she could not help it. Bad from life's history. And the children of the future are crying: give, oh give us as our heritage healthy bodies, strong minds, pure hearts, and we will take care of the rest.

Children inherit not only lands, money, position, but they inherit morals and impulses, form and features, habits and tastes; yes, the bodies and souls of their parents.

What can be done to remedy some of these wrongs, or what shall we do in order to begin a reformation? We might better ask, how shall we give the children good breeding? We often shirk, ourselves, from effort, and point to a higher power outside of ourselves that in some mysterious, miraculous way shall bring order out of chaos, right out of wrong. We speak reverently when we say that we are not limiting the power of God. But a Divine Wisdom has laid down an inflexible rule that applies as well to children as fruit. You cannot gather grapes from thorns nor figs from thistles. Men and women must study the laws of life and health, and obey those laws. Their bodies and souls must be disciplined wisely and conscientiously, in order that they may become healthy parents of healthy children, body and soul. The prevention of disease and crime by giving to a child a good, clean, healthy birth is far more effectual than all the legislation that can be enacted to the same effect. It is better to give to a child a sound body rather than to make it sound after birth. Parents must exhibit a rational, loving, thoughtful care in giving existence to children. They must be consecrated to the high office. Marriage must not be entered upon thoughtlessly, recklessly. Children must not be the offspring of chance. They must be born of love and loved before they are born. Of all the sad, pitiful victims of depravity, none so appeal for sympathy as the unwelcome, undesired child, and of all the wrongs that can be inflicted upon it in after life none can equal the wrongs done to it before its birth. To be well bred is their birthright. Shall we dare refuse? If the body is deformed or diseased, the mind depraved, the whole tendency of its being toward that which is false, sinful and frivolous, it is frequently laid to the door of an overburdened Providence instead of where it rightly belongs, to the unwholesome and unholy lives of its ancestors.

The unborn child sees through mother's eyes, hears through her ears. Every thought of her mind, ever act of her life, strikes upon the tender organization, pulsates through every fiber of its little being. By her it is being molded largely, by her is its destiny for good or evil being formed.

Supposing the soul of the expectant mother rebels, that instead of trying to promote the highest good of the unborn life she seeks to hinder it. Instead of cherishing it and loving it she hates it and seeks to destroy it. What an unequal struggle that child must have in the race of life, because it was robbed of its birthright.

Murderers, thieves, defrauders, defamers and libertines are born. The mother alone is not the only factor that is giving that which is highest and holiest or lowest and blackest. We need a consecrated fatherhood as well as a consecrated motherhood. If children were rightly born, they would be born of love which is born of God, for God is love. The infinite Father designed that they should be thus born, that every step of their life, both before and after birth, should be attended by tenderest love and helpful sympathy, that every care and strengthening influence should be thrown about it, that it may be able to enter life as a saving, redeeming factor. Scientists are telling us today that it takes ten generations to make a man or woman. If this is true, in order that ten generations hence shall have as their inheritance a clean, strong ancestry and be well bred, it is necessary that our tenth shall be of the highest quality and fullest quantity.

There must be a cultivation of the soil of our hearts, the weeds of selfishness, ill temper, fault finding, ignorance, filthy habits, impure thoughts, must be eradicated, and the seeds of joy, hope, good cheer, industry, frugality, purity, sown, and all brought to their highest development by the pure, strong atmosphere of love.

Then shall your child, well bred and well born, be strong for life and its battles; his hands will be willing, his body strong, his heart true and brave and his soul pure, and into his face shall come a light that is not seen on sea or land, a light that reflects the smile of God and he is a man born of love, nurtured in love, and in loving all that is beautiful, good and true, goes out to fulfill his mission in life.

DISCUSSION.

Voice: I feel that this subject has been very well brought before us, and there is so much in it that we can hardly comprehend it, and yet I feel that the next generation will be so much better by the teaching we have; but we should have more of the young women at our mothers' meetings, to get the benefit of this teaching. There is so much attention, as the speaker just said, paid to raising good stock and not so much to children, and it is time we began to give more attention to this matter.

THE RELATION OF GOOD COOKING TO THE HEALTH OF THE FAMILY.

MISS BELLE C. CROWE, INSTRUCTOR IN DOMESTIC SCIENCE, AGRICULTURAL COLLEGE, MICHIGAN.

In discussing this topic a question presents itself at once. What is good cookery? Good cookery can be said to be the selection and preparation of raw food and materials to suit the varied needs of a civilized and refined people. Our standard in this matter must be the accepted taste and most scientific knowledge of those who have had the advantage of the broadest culture and most accurate scientific research; but in view of the fact that there are many individual peculiarities of digestion, so that we have the proverb, "One man's meat is another man's poison," it is unwise to think or speak dogmatically about what is good in cookery.

Having made the foregoing qualification, let me offer some opinions as to what good cookery is in detail, or what one, whom we should be justified in calling a good cook, would know.

Mr. Ruskin said cookery means "the knowledge of all herbs and fruits and balms and spices, and all that is healing and sweet in the fields and groves and savory in meats; it means carefulness and inventiveness, and willingness and readiness of appliances; it means the economy of your grandmothers and the science of modern chemists; it means much testing and no wasting; it means English thoroughness and French art, and Arabian hospitality; and, in fine, it means that you are to be perfectly and always ladies—loafgivers."

In other words, a good cook is not necessarily one who knows by heart a long list of recipes, such as Susie's Spider Corn Cake, Sally Lunn, Brown Betty, Aunt Caddie's Cake with Lily frosting, etc., and who is able to serve these and many other dishes in a most toothsome and attractive way; but she is one who knows the nature of food materials, and can tell how food materials will behave themselves upon the application of heat or cold; one who has learned a great deal about proportions to be used to obtain desired effects, and who by accurate observations and experiments knows what results will be gained by the mixing of ingredients; she can trace the development of the more complex dishes from the simpler forms of preparation, and in this way grasps the possibilities in her materials and delights us with new dishes with the greatest ease. She realizes what are the essential characteristics of the different classes of food, such as soups, desserts, vegetables and meats. For instance, she knows that to serve vegetables so they can be called well cooked she must have them of agreeable tenderness, of sufficient flavor, and she also exercises taste in providing or withholding a sauce. Her sauce may be only melted butter, and the quantity only as much as will merely moisten the vegetable, but she knows that even such a simple sauce will give flavor and pleasant moisture, and add nutriment. Chemists tell us that vegetables have very little fat in their composition, but are largely water and starch, and the good cook knows by using butter she is adding what the vegetable

lacks, and is thereby serving food that is more complete for nutritive purposes that it would be without the butter or other sauce.

The intelligent cook realizes that a soup or broth is a liquid food of various consistencies, composed of water or milk and the flavors, soluble extracts, and small solid pieces of meat, vegetables, eggs, pastes, etc., with appropriate seasonings. A similar process in which cereals alone are used would produce a gruel. Applying such a general definition of soups, she can make an infinite variety, and is largely independent of the cook books. She appreciates the advantage of serving a variety of foods and dishes, because it cultivates the taste of the family for many different kinds of food, and they are not apt to be so hard to please as those who have not acquired a taste for more than a very few dishes. Valuable resources are often allowed to go to waste because the one who does the cooking has not taught others to acquire a taste for many different things. Mushrooms that sell as delicacies at $1 a pound or even more in the large markets, are allowed to go to waste by many who could have them for the trouble of picking them. Watercress, little fish, parts of beef, veal and lamb, are all wasted by many who could have them for nothing.

Have you ever noticed how many pages of the ordinary cook book are devoted to cake recipes? There are scores of rules oftentimes. Now, a good cook knows that there are about two or three recipes for cake and that the others are variations of those two or three mother rules. How simple it is to divide cakes into two classes, thus: cakes with butter, cakes without butter. The only rule a cook needs to know for the first class is the I, II, III, IV cake recipe, which she can vary to her heart's content. Then for the cakes without butter, if she memorizes a sponge cake or an angel cake recipe, she can ring similar changes on this other rule.

The good cook knows how much baking powder is necessary for a cup of flour, how many eggs it will take to thicken a pint of milk to a baked custard consistency, how many teaspoons of cornstarch will be required to thicken a cup of liquid to a sauce consistency, so that she is master of the rules and not in bondage to the cook book.

The good cook knows that yeast is a very tiny plant which grows and needs attention like a geranium, and she also knows under what conditions it will grow best; or, if she would wish to retard the bread-making process, she knows the safe limit in applying cold, thereby relieving her mind of the terrors that too often attend the making of bread.

She is one who knows that water cannot be made hotter by adding fuel or turning up the gas to make it boil harder after it is once at the boiling point. She knows that butter can be made hotter than water or milk, so that, in making a sauce of butter, flour and milk she understands what advantage is gained in heating the butter first and adding the wetting last. She knows that lard can be made hotter than butter, while olive oil will rise to the highest heat before burning of all the fats used in the kitchen.

The good cook can prepare rice so the grains are left comparatively dry and separate, and she would be ashamed to send to the table the pasty mess that is too often presented. She is likely, too, to serve rice frequently, because she realizes how inexpensive it is, its high

food value, and how easily it is digested, and because she serves it well she makes many persons like it who scorn it as it is usually cooked.

The good cook knows how to use meat to get the most good from it. She realizes that in cooking a soup, a stew and a roast she must employ different methods, and she understands the reasons for the differences. She is careful of the temperature she uses in the processes. She knows the method that will soften tough fibers, which method will develop the best flavors, what parts of the animal are suitable for a given purpose, or how to make the most of any given cut.

It has been said that good cooks are not clean, but that is not the kind that we are thinking of. The good cook is clean. She has learned something about dangerous bacteria that may be present at any time and everywhere, and she protects her food from flies and dust, roaches and ants, and her dishes and cloths from putrid remnants of former meals. It is no uncommon thing to find food served with an unpleasant flavor that is foreign to itself and there is good reason to believe that the bad flavor is due to carelessness in washing the dishes used in the work. A greasy dishcloth is sufficient to change the flavor of the coffee if the soiled cloth has been used in the coffee pot. It is necessary to have a great deal of fine feeling in the preservation and development of good or bad flavors in food.

She appreciates the value of a boiling or a very high temperature in rendering food and dishes free from injurious germs.

The good cook is economical, because she knows how to make the most of left-over food, while at the same time, she uses judgment in choosing between outlay of time and strength, and the cost of buying fresh food which would require less time and labor.

A good cook pays respect to the chemical composition of the food in making her bills of fare, so that she may serve well balanced meals; that is, the fats, protein and carbohydrates would be in nearly correct proportions. She knows that some foods are chiefly used as tissue builders and repairers of waste, while others give us energy and heat, and at less cost than the tissue builders could give us energy and heat.

In this connection, I may say, she knows better than to believe many of the extravagant statements made by manufacturers of breakfast cereals, respecting the wonderfully concentrated character and high value of their respective preparations. She will not put down to us four teaspoonfuls of Grapenuts and tell us that we have enough to support us through half a day's work, or try to make us believe that we are as well provisioned as if she had served us a rich, juicy beefsteak.

The good cook does not think that diet can ever be a matter of no importance or that anything is good enough so long as hunger does not trouble us, or our livers do not rebel.

I have not mentioned the ethical requirements essential in a good cook. She should not be arrogant and make all the other members of the family afraid of her. The training of a cook which does not contemplate the ethical nature and its improvement is sadly lacking.

I have recited a few of the virtues of a good cook. Sometimes householders are rash enough to expect many of these virtues and much of this knowledge for sums of money varying from $10 to $30 a month; or perhaps in the case of a wife and daughter, for board and clothes.

Considering the topic as a whole, the relation of good cooking to the health of the family, it is possible that good cooking may conduce to good health in all members of the family, except one, namely, the one who does the cooking. For good work that does not injure the worker, a well equipped kitchen, convenient and pleasant, and sufficient help are certainly necessary, and it is folly to expect good results when the appliances and conditions are not suitable. The importance of good cooking is suggested when we think of the pains taken by the intelligent farmer to select right fodder or feed for his barnyard stock, or the care given to diet by the athlete, the jockey or the crack shot. How can we be consistent if we ignore the importance of feeding children so that they can grow strong and vigorous, or of feeding adults so that they shall have sufficient, and not too much, to suit their occupations and the various needs of the mental, moral and physical natures.

I should like to say something on the subject of how and where we shall train the good cooks, but being an instructor in a cooking school, modesty or meekness, or an indisposition of some sort, hinders me. However, let me warn you against resting all your faith in the efficiency of the cooking school by a few lines of classic wisdom:

"The Queen of Hearts, She made some tarts,
All on a summer's day; The Jack of Hearts,
He stole the tarts, And with them ran away.

The King of Hearts Had seen the tarts,
And called ye Jack a fool,
For well he wot, The tarts Jack got
Were made at Cooking School."

DISCUSSION.

Mrs. Mayo: What food gives energy and force?

Miss Crowe: Foods that contain fat, such as eggs, etc. The starchy foods, such as rice, tapioca, bread, etc. The vegetable products generally would be energy and force producing foods, while meat foods would be more largely tissue builders.

Mrs. Jones: Is it not true that a variety of food from day to day helps to supply the waste?

Miss Crowe: Yes, for by giving variety you are more likely to arrive at a well balanced ration, because very few can take time, even if they know how, to get the correct amounts of each food, therefore if you secure a variety you are more likely to have well balanced fares.

Voice: I wish Miss Crowe would tell us how to make good coffee.

Miss Crowe: Have a clean coffee pot for one thing, and have it as fresh as possible. It is no harm if one is a long distance from the grocery store to have your own coffee mill and grind your coffee yourselves. With fairly good coffee and a clean coffee pot, mix an egg with the ground coffee, and pour the water on and boil not over ten minutes. The idea is to have the water fresh and keep your flavors. For black coffee, use one rounding tablespoon for breakfast; a level tablespoonful would make good strong coffee to one cup of water.

Voice: How do you cook rice so it will remain whole, dry and separate?

Miss Crowe: For a small quantity I usually like to have the water boiling hard, and drop the rice, which has been washed, into the boiling water rather gently so it will not stop boiling. If you keep up the heat it will not stick together. Then it is wise to keep the rice cooking rapidly and to have plenty of water. If you have a small quantity of rice you can take thirty-two times the quantity of water. It is much

better to have water to pour off when the rice is done, as it will be more separate. The main points are to have plenty of water, and put it in boiling water when you start to cook it. The reason for using the egg shell in settling coffee is that there is some albumen sticking to the inside of the egg shell, and this will close around the coffee grounds, keeping the grounds together so they will not be scattered through the coffee.

Voice: In speaking of coffee, do you not think it is better to percolate it?

Miss Crowe: If you have a French coffee pot or percolater, you will not need to use the egg.

Voice: I think it requires even less coffee.

Miss Crowe: I do not know about that, but it is a nice way to do. I think in that case you would need to put the coffee pot in hot water. I find it necessary to pour the water on a little at a time, and keep the pot in hot water while doing it, and then you can send it to the table hot.

RESOLUTIONS PASSED AT THE CLOSING SESSION OF THE INSTITUTE.

WHEREAS, The Business Men's Association of Ann Arbor has contributed materially to the success of this meeting of the State Round-up Institute in many ways, and especially by printing beautiful souvenir programs,

Resolved, That the thanks of the Institute are hereby tendered that association for their well directed efforts in our behalf.

After the great blizzard we have endured on our journeys from the city to the Institute hall, and after the great blizzard of thin and heated air given us at the day sessions of this Institute, the cool and refreshing liquid air furnished us at great expense and with his characteristic self-sacrifice by Dr. Freer of the University, has come to us like lemonade in a harvest field; therefore

Resolved, That we express our gratitude to Dr. Freer for the delightful entertainment, combined with solid instruction, that he has given us.

The immediate preparation for a State Institute must invariably fall upon the shoulders of a few men. If this work is well done the success of the meeting is well assured. In the case of this State Institute the work of preparation has been done with a thoroughness and efficiency almost unprecedented. To Mr. F. E. Mills, the efficient and honored Secretary of the Washtenaw County Farmers' Institute Society, belongs much of the credit for the success of this Institute. By great personal sacrifice and untiring exertion he has secured for us some of the most enjoyable features of the program. During the progress of the meetings he has attended to the vast array of details that inevitably come up at such a time; therefore

Resolved, That we extend to him our hearty thanks and congratulate him and his co-workers on the successful issue of their efforts.

Resolved, That the thanks of this convention are hereby tendered President Wm. Campbell for the very capable manner in which he has presided at the day sessions of the Institute, as well as for his invaluable assistance in the work of preparation for the same.

WHEREAS, As our great University, beloved by every intelligent citizen of Michigan, and honored and respected throughout the civilized world, has opened wide its doors for our entertainment and instruction, it has been a delight to us as delegates and visitors to enjoy its hospitality, visit its halls, meet its officers and teachers, examine its work, and thus come more closely in touch with its magnificent work, and feel the invigorating and inspiring atmosphere that characterizes it; therefore

Resolved, That this Institute can but inadequately express its appreciation of the untiring efforts of President Angell, Secretary Wade, and their co-workers in the faculty, to make our visit pleasant and to give us a clear insight into the inner workings of this great institution, and we pledge them our hearty and enthusiastic support in the great work they are doing.

We appreciate the value to us as citizens of this State of a visit to the institutions supported by our taxes; therefore

Resolved, That we appreciate the kindness of the Detroit, Ypsilanti & Ann Arbor street car line in extending to our Institute the courtesy of a free ride to Ypsilanti, giving us an opportunity to visit the Normal College.

Resolved farther, That we tender to Captain Allen, the honored mayor of Ypsilanti, our thanks for his disinterested persistency and efficient services in obtaining for us the above concession.

Resolved, That to Professor Stanley, and the Glee and Mandolin Clubs of the University of Michigan, we express our sincere thanks and hearty appreciation for the very material aid they have rendered to the success of this Institute, in furnishing the most excellent and entertaining music for our evening sessions.

Resolved, That this Institute Society, through Superintendent C. D. Smith, request of every Congressman and Senator from this State that he shall defend and support the Grout bill, and that the Superintendent shall write to them to that effect.

Resolved, That the State Farmers' Round-up Institute of Michigan heartily endorses the efforts which are making to secure National legislation looking to the regulation of interstate traffic in adulterated foods, and to this end heartily approves of the Brosius bill now pending before Congress.

Resolved farther, That the Superintendent of this Institute be requested to send a copy of these resolutions to each Senator and member in Congress from this State, and to the Honorable Mr. Hepburn, Chairman of Interstate Commerce, and urge them to take speedy and favorable action on this measure.

Resolved, That it is the sense of this Institute that a reciprocity treaty with Argentine Republic, whereby the present import duties on wool shall be lessened, is both unwise as a matter of policy and unjust to the farming classes.

Resolved, That we, the members of the Washtenaw Farmers' Institute Society, hereby extend our most hearty congratulations to the State Board of Agriculture in having selected so able and proficient a Superintendent of Institutes as Prof. C. D. Smith.

Carried unanimously.

WM. CAMPBELL, *President.*
F. E. MILLS, *Secretary.*

GENERAL REPORT OF INSTITUTE WORK.

The method of arranging the dates, programs and speakers for the County Institutes, which experience has shown to work well in the past, was continued through the year. By correspondence through the Secretaries of the County Institute Societies the dates for holding the Institutes were arranged. The Institute Societies suggested the topics which ought to be discussed in the counties interested and sometimes the speakers whom they desired to discuss them. The Superintendent was then able to arrange the itineraries of the speakers in such a way as to economize both salaries and traveling expenses.

I have given at the close of the financial statement, on page ——, an approximate statement of the miles traveled by workers to carry on the Institute work. After an Institute meeting was appointed and the workers selected application was made to the railroads over which each of these workers traveled for permits for the workers to travel at half fare. The gratitude alike of the Board and of the farmers of Michigan is due the railroads for their unfailing courtesy in this matter and their generosity in donating the large sum to which these concessions aggregate. Especial mention ought to be made in this connection of the generosity of the Michigan Central, Pere Marquette, Chicago & Grand Trunk, Grand Rapids & Indiana, Ann Arbor, Cincinnati Northern, Duluth, South Shore & Atlantic, Manistee & Northeastern, Minneapolis, St. Paul & Sault Ste. Marie, Munising, Wabash, and Saginaw, Tuscola & Huron railroads.

I desire to report also the uniform kindness and courtesy of the Michigan Passenger Association and its efficient secretary, Mr. James Houston. This association has appreciated the value of the Institute work from its beginning, and has never failed to extend all possible benefits to it.

By the system adopted in Michigan, much of the work falls upon the officers of the County Institute Societies, especially upon the Secretaries. A list of the Presidents and Secretaries of County Institute Societies for 1899 and 1900 follows:

PRESIDENTS AND SECRETARIES OF COUNTY FARMERS' INSTITUTE SOCIETIES FOR 1899-1900.

County.	President.	Address.	Secretary.	Address.
Alcona	J. Van Buskirk	Harrisville	L. A. Colwell	Harrisville.
Alger*				
Allegan	T. G. Adams	Shelbyville	C. E. Bassett	Fennville.
Alpena	J. D. Kingsbury	Alpena	E. H. Toland	Ossineke.
Antrim	Gilbert T. Bentley	Atwood	M. E. Byers	Eastport.
Arenac	Nelson Deford	Maple Ridge	S. E. Hayes	Standish.
Baraga*				
Barry	Walter J. Robinson	Middleville	W. R. Harper	Middleville.
Bay	Anthony Kern	Auburn	Wm. Gaffney	Colfax.
Benzie	E. S. Northrup	Thompsonville	R. B. Reynolds	Frankfort.
Berrien	A. N. Woodruff	Watervliet	W. N. Sietz	Benton Harbor.
Branch	J. D. Studley	Union City	E. E. Lewis	Coldwater.
Calhoun	C. C. McDermid	Battle Creek	Frank Minges	Battle Creek.
Cass	Jas. G. Hayden	Cassopolis	J. B. Harmon	Cassopolis.
Charlevoix	M. M. Burnham	East Jordan	E. B. Ward	Charlevoix.
Cheboygan	P. L. LaPres	Cheboygan	Q. C. Ball	Mullet Lake.
Chippewa	Simon Parker	Sault Ste. Marie	E. Batdorf	Strongville.
Clare			A. J. Doherty	Clare.
Clinton	Jerome Dills	DeWitt	Henry N. Webb	DeWitt.
Crawford	Perry Ostrander	Grayling	John J. Coventry	Frederick.
Delta*				
Dickinson*				
Eaton†	Jas. H. Gallery	Eaton Rapids	Geo. A. Perry	Charlotte.
Emmet	R. C. Light	Bay Shore	E. A. Botsford	Petoskey.
Genesee	S. R. Billings	Davison	Frank H. Hill	Davison.
Gladwin	Frank Leonard	Gladwin	H. R. Clarke	Gladwin.
Gogebic*				
Grand Traverse	Robert Barney	Traverse City	E. O. Ladd	Traverse City.
Gratiot	Newton Burns	St. Louis	Wallace M. Comstock	Ithaca.
Hillsdale	E. F. Brown	Reading	Earl H. Dresser	Litchfield.
Houghton*				
Huron	John Hunt	Verona Mills	Mrs. Geo. Pangman	Verona Mills.
Ingham	Harvey Wilson	Mason	Harvey M. Young	Mason.
Ionia	Amos Welch	Ionia	C. A. Preston	Ionia.
Iosco	H. L. Drake	Tawas City	Len J. Patterson	Tawas City.
Iron	Olaf Helgemo	Iron River	Fay G. Clark	Iron River.
Isabella	W. W. Preston	Mt. Pleasant	M. E. Kane	Mt. Pleasant.
Jackson	H. E. Dewey	Concord	A. S. Wolcott	Concord.
Kalamazoo*				
Kalkaska	Wm. Dick	South Boardman	Wm. T. Hayward	South Boardman.
Kent	L. J. Rindge	Grand Rapids	Wm. K. Munson	Grand Rapids.
Keweenaw*				
Lake	S. Fradenburg	Reed City	W. S. Gordon	Chase.
Lapeer	W. W. Stickney	Lapeer	G. W. Carpenter	Lapeer.
Leelanau*				
Lenawee	M. T. Cole	Palmyra	A. B. Graham	Adrian.
Livingston	Frank R. Crandal	Howell	H. E. Reed	Howell.
Luce*	S. N. Dutcher	Newberry	Correspondent	
Mackinac*				
Macomb	E. H. Peck	Warren	Frank D. Wells	Rochester.
Manistee	W. W. Wood	Yates	J. H. Read	Pomona.
Marquette*				
Mason	E. P. Bidwell	Scottville	S. A. Louden	Scottville.
Mecosta	Arnold Ely	Big Rapids	C. F. Kiefer	Borland.
Menominee	Edw. Sawbridge	Stephenson		

* No institute society.

† County Agricultural Society.

PRESIDENTS AND SECRETARIES OF COUNTY FARMERS' INSTITUTE SOCIETIES.—*Concluded.*

County.	President.	Address.	Secretary.	Address.
Midland	Jas. Anderson	Midland	J. H. Johnson	Laporte.
Missaukee*				
Monroe	Albert Bond	London	John Nichols	Ida.
Montcalm	J. E. Gibbs	Edmore	A. N. Demoray	Edmore.
Montmorency*				
Muskegon	S. A. Aldrich	Muskegon	J. H. Whitney	Muskegon Heights.
Newaygo	Neil McCallum	Hesperia	W. C. Stuart	Fremont.
Oakland	G. M. Trowbridge	Pontiac	Fred B. Giddings	Pontiac.
Oceana	Benton Gebhart	Hart	C. F. Hale	Shelby.
Ogemaw	C. J. Phelps	West Branch	G. G. French	West Branch.
Ontonagon*				
Osceola	Reese Jones	Tustin	G. D. DeGoit	Tustin.
Oscoda	Chas. Kittle	Mio	Robert Shepard	Biggs.
Otsego	W. J. Jubb	Gaylord	R. D. Bailey	Gaylord.
Ottawa	A. G. Van Hees	Zeeland	Fred Luther	Lamont.
Presque Isle*				
Roscommon*				
Saginaw	R. W. Beeman	Swan Creek	J. A. Slocum	Saginaw, W. S.
Sanilac	H. Schlichter	Brown City	Simon Bricker	Brown City.
Schoolcraft	D. W. Thompson	Manistique	F. Greenwood	Manistique.
Shiawassee	P. B. Reynolds	Owosso	A. B. Cook	Owosso.
St. Clair	C. S. King	Port Huron	Jas. Dunn	Emmett.
St. Joseph	Geo. Engles	Centerville	H. W. Garman	Parkville.
Tuscola	John Marshall	Cass City	J. W. Murphy	Cass City.
Van Buren	E. A. Haven	Bloomingdale	Stephen Doyle	Hartford.
Washtenaw	Wm. Campbell	Ypsilanti	F. E. Mills	Ann Arbor.
Wayne	Jas. R. Clark	Belleville	P. B. Whitbeck	Plymouth.
Wexford	R. C. Norris	Cadillac	Elwood Peck	Cadillac.

* No institute society.

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County.	President.	Address.	Secretary.	Address.
Alcona	J. Van Buskirk	Harrisville	L. A. Colwell	Harrisville.
Alger*				
Allegan	T. G. Adams	Shelbyville	C. E. Bassett	Fennville.
Alpena	Josiah D. Kingsbury.	Alpena	E. H. Toland	Ossineke.
Antrim	C. E. Mills	Alba	P. T. Baldwin	Alba.
Arenac	Peter Gilbert	Sterling	H. V. Vay	Omer.
Baraga*				
Barry	Walter J. Robinson	Middleville	W. R. Harper	Middleville.
Bay	Wm. McKay	Kawkawlin	Thomas Arnet	Kawkawlin.
Benzie	Thomas B. Pettit	Benzonia	R. B. Reynolds	Frankfort.
Berrien	Thomas Mars	Berrien Center	W. W. McCracken	Buchanan.
Branch	J. D. Studley	Union City	E. E. Lewis	Coldwater.
Calhoun	Frank B. Garratt	Battle Creek	Lillian Adams	Battle Creek.
Cass	Jas. G. Hayden	Cassopolis	John Dunning	Cassopolis.
Charlevoix	M. M. Burnham	East Jordan	E. B. Ward	Charlevoix.
Cheboygan	Chas. F. Smith	Cheboygan	R. J. Taylor	Manning.
Chippewa	Henry Cottle.	Rudyard	James McCarron	McCarron.
Clare	L. L. Kelley	Farwell	A. R. Canfield	Clare.
Clinton	Enos Blizzard	St. Johns	Decatur Bross	St. Johns.
Crawford	Perry Ostrander	Grayling	Wellington Batterson	Frederick.
Delta*				
Dickinson*				
Eaton	J. H. Gallery	Eaton Rapids	Geo. A. Perry	Charlotte.
Emmet	Jas. L. Morrice	Harbor Springs	E. E. Palmeter	Harbor Springs.
Genesee	Dexter Horton	Fenton	Frank Hill	Davison.
Gladwin	Frank Leonard	Gladwin	H. R. Clarke	Gladwin.
Gogebic*				
Grand Traverse.	G. A. Robertson	Traverse City	E. O. Ladd	Old Mission.
Gratiot	Newton Burns	Ithaca	W. M. Comstock	Ithaca.
Hillsdale	E. T. Parker	Hillsdale	N. I. Moore	Moscow.
Houghton*				
Huron	John Hunt	Verona Mills	Allen Ramsey	Harbor Beach.
Ingham	L. H. Ives	Mason	H. M. Young	Mason.
Ionia	A. M. Welch	Ionia	C. A. Preston	Ionia.
Iosco	H. L. Drake	Tawas City	L. J. Patterson	Tawas City.
Iron*				
Isabella	Chas. M. Brooks	Mt. Pleasant	M. E. Kane	Mt. Pleasant.
Jackson	J. W. Hutchins	Hanover	E. G. Knight	Hanover.
Kalamazoo*				
Kalkaska	C. E. Bartholomew	Kalkaska	D. C. Rosenbury	Kalkaska.
Kent	J. A. Symes	Sparta	Oscar W. Braman	Grand Rapids.
Keweenaw*				
Lake	Caleb Robinson	Chase	W. S. Gordon	Chase.
Lapeer	C. A. Bullock	Hadley	F. E. O'Dell	Metamora.
Leelanau*				
Lenawee	A. P. Coddington	Tecumseh	A. B. Graham	Adrian.
Livingston	B. F. Bachelder	Howell	R. C. Reed	Howell.
Luce*				
Mackinac*				
Macomb	W. H. Norton	Washington	F. D. Wells	Rochester.
Manistee	E. H. Wexstaff	Manistee	J. Herbert Read	Pomona.
Marquette*				
Mason	E. Payson Bidwell	Scottville	S. A. Louden	Scottville.
Mecosta	Arnold Ely	Big Rapids	C. F. Kiefer	Borland.
Menominee	Edw. Sawbridge	Stephenson		

* No institute society.

PRESIDENTS AND SECRETARIES OF COUNTY FARMERS' INSTITUTE SOCIETIES.—*Concluded.*

County.	President.	Address.	Secretary.	Address.
Midland	Wm. Anderson	Midland		
Missaukee*				
Monroe	W. H. Cochrane	Dundee	John Nichols	Ida.
Montcalm	Thomas Kain	Coral	F. S. King	Coral.
Montmorency*				
Muskegon	S. A. Aldrich	Muskegon	J. H. Whitney	Muskegon Heights.
Newaygo	Henry McCarty	Fremont	W. C. Stuart	Fremont.
Oakland	B. J. Fuller	Pontiac	Geo. Campbell	Big Beaver.
Oceana	Caleb Davis	Mears	Chas. F. Hale	Shelby.
Ogemaw	Christian Yettel	West Branch	Mrs. Cora L. Tolman	West Branch.
Ontonagon*				
Osceola	U. S. Holdridge	Hersey	H. A. Millard	Hersey.
Oscoda	Chas. V. Kittle	Spoar	Robert Shepard	Biggs.
Otsego	Abram VanAnken	Vanderbilt	R. D. Bailey	Gaylord.
Ottawa	John Jackson	Coopersville	Arthur Avery	Forestgrove.
Presque Isle	Merritt Chandler	Onaway	C. M. Sage	Tower.
Roscommon*				
Saginaw	R. W. Beeman	Swan Creek	J. A. Slocum	Saginaw, W. S.
Sanilac	Dell Dawson	Carsonville	S. Bricker	Brown City.
Schoolcraft	D. W. Thompson	Manistique	Fred Greenwood	Manistique.
Shiawassee	N. K. Potter	Bancroft	J. J. Whelan	Vernon.
St. Clair	C. S. King	Port Huron	Jas. Dunn	Emmett.
St. Joseph	Geo. Engles	Centerville	Elmer L. Snyder	Centerville.
Tuscola	J. E. Lewis	Vassar	W. T. Lewis	Vassar.
Van Buren	Truman Lampson	Covert	F. A. Burger	Bangor.
Washtenaw	H. J. Pinckney	Ypsilanti	Chas. E. Foster	Ypsilanti.
Wayne	J. H. Hanford	Plymouth	P. B. Whitbeck	Plymouth.
Wexford	R. C. Norris	Cadillac	Elwood Peck	Cadillac.

* No institute society.

COUNTY FARMERS' INSTITUTES, 1899-1900.

WITH DATES AND ATTENDANCE.

[Attendance reported by conductors. Includes women's sections.]

County.	Place.	Date.	Attendance.						Total.	Average per session.
			First day.			Second day.				
			A. M.	P. M.	Eve.	A. M.	P. M.	Eve.		
Alcona	Harrisville	Jan. 17-18, 1900	57	237	167	44	88	.....	593	118
Alger*	Munising	Dec. 12, 1899	.....	.....	.....	.....	.....	.....	.....	.....
Allegan	Hopkins' Station.	Feb. 1-2, 1900	60	160	125	78	155	.....	578	115
Alpena	Flanders	Jan. 15-16, 1900	38	65	98	45	141	.....	387	77
Antrim	Atwood	Dec. 13-14, 1899	60	101	150	115	222	.....	648	129
Arenac	Maple Ridge	Jan. 18-19, 1900	28	130	150	103	150	.....	561	112
Baraga	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Barry	Hastings	Jan. 31, Feb. 1, 1900	50	154	65	130	250	.....	649	129
Bay	Auburn	Jan. 25-26, 1900	40	125	125	85	191	.....	566	113
Benzie	Thompsonville	Dec. 15-16, 1899	46	74	153	56	61	.....	390	78
Berrien	Benton Harbor	Jan. 30-31, 1900	65	150	175	65	65	.....	520	104
Branch	Coldwater	Feb. 13-14, 1900	70	224	164	227	544	248	1,477	246
Calhoun	Battle Creek	Jan. 9-10, 1900	144	298	116	177	366	.....	1,101	220
Cass	Cassopolis	Jan, 10-11, 1900	150	375	300	175	722	300	2,022	337
Charlevoix	East Jordan	Dec. 8-9, 1899	7	74	145	30	45	.....	301	60
Cheboygan	Cheboygan	Dec. 11-12, 1899	8	25	64	48	116	93	354	59
Chippewa	Sault Ste. Marie	Dec. 15-16, 1899	.....	15	.....	18	70	.....	103	34
Clare	Clare	Feb. 7-8, 1900	59	167	265	78	278	309	1,156	193
Clinton	DeWitt	Jan. 19-20, 1900	90	225	275	95	300	.....	985	197
Crawford	Grayling	Dec. 6-7, 1899	6	32	98	17	91	.....	244	49
Delta	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Eaton	Charlotte	Jan. 30-31, 1900	90	200	155	150	250	.....	845	169
Emmet	Petoskey	Dec. 18-19, 1899	60	112	80	120	150	.....	522	104
Genesee	Fenton	Jan. 31, Feb. 1, 1900	82	150	125	150	416	.....	923	185
Gladwin	Gladwin	Jan. 25-26, 1900	38	55	.....	45	92	75	305	61
G'd Traverse	Traverse City	Feb. 7-8, 1900	90	130	135	115	141	.....	611	122
Gratiot	Ithaca	Jan. 17-18, 1900	60	250	175	250	525	.....	1,260	252
Hillsdale	Jonesville	Jan. 16-17, 1900	20	60	30	30	100	.....	240	48
Houghton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Huron	Bad Axe	Jan. 23-24, 1900	100	300	400	250	550	.....	1,600	320
Ingham	Leslie	Feb. 1-2, 1900	74	224	184	185	402	.....	1,069	214
Ionia	Ionia	Jan. 17-18, 1900	300	500	430	385	735	.....	2,350	470
Iosco	Tawas City	Jan. 19-20, 1900	25	119	143	45	84	.....	416	83
Iron	Iron River	Dec. 8-9, 1899	.....	20	25	15	44	.....	104	26
Isabella	Mt. Pleasant	Jan. 18-19, 1900	68	162	184	125	234	.....	773	154
Jackson	Concord	Feb. 20-21, 1900	150	200	300	125	200	.....	975	195
Kalkaska	South Boardman	Dec. 19-20, 1899	50	72	85	48	90	.....	345	69
Kent	Grand Rapids	Jan. 23-24, 1900	75	125	40	75	165	.....	480	96
Lake	Chase	Dec. 20-21, 1899	34	111	207	54	106	.....	512	102
Lapeer	Lapeer	Jan. 30-31, 1900	103	150	163	130	448	.....	994	199

* County one-day institutes.

COUNTY FARMERS' INSTITUTES, 1899-1900.—*Concluded.*

County.	Place.	Date.	Attendance.						Total.	Average per session.
			First day.			Second day.				
			A. M.	P. M.	Eve.	A. M.	P. M.	Eve.		
Leelanau										
Lenawee	Tecumseh	Jan. 12-13, 1900	125	310	380	325	515		1,655	331
Livingston	Howell	Feb. 2-3, 1900	120	450	350	350	750		2,020	404
Luce*	Newberry	Dec. 18, 1899		56					56	56
Mackinac										
Macomb	Warren	Feb. 7-8, 1900	60	164	172	80	253		729	146
Manistee	Pomona	Dec. 8-9, 1899	77	109	231	137	125		679	136
Mason	Scottville	Dec. 21-22, 1899	54	86	110	32	53		335	67
Mecosta	Mecosta	Dec. 14-15, 1899	45	85	240	85	77		532	106
Menominee	Stephenson	Dec. 6-7, 1899								
Midland	Midland	Jan. 26-27, 1900	48	56	30	65	144		343	68
Missaukee										
Monroe	London	Jan. 17-18, 1900	100	210	225	175	285		995	199
Montcalm	Edmore	Jan. 15-16, 1900	90	202	275	215	222		1,004	201
Montmorency										
Muskegon	Muskegon	Jan. 24-25, 1900	76	160	155	100	200		691	138
Newaygo	Hesperia	Jan. 25-26, 1900	40	75	100	75	125		415	83
Oakland	Pontiac	Jan. 18-19, 1900	30	165	96	170	307		768	153
Oceana	Hart	Jan. 26-27, 1900	20	100	75	125	150		470	94
Ogemaw	West Branch	Dec. 4-5, 1899		19	113	13	31		176	44
Ontonagon										
Osceola	Tustin	Dec. 4-5, 1899		49	151	66	114		380	95
Oscoda	Mio	Dec. 14-15, 1899	30	60	111	30	134	99	464	77
Ottawa	Coopersville	Jan. 22-23, 1900	75	200	165	145	258		843	168
Otsego	Gaylord	Dec. 8-9, 1899	26	98	225	76	171		596	119
Presque Isle										
Roscommon										
Saginaw	Freeland	Feb. 1-2, 1900	160	300	300	250	415		1,425	285
Sanilac	Brown City	Jan. 24-25, 1900	136	475	300	312	550	375	2,148	358
Schoolcraft	Manistique	Dec. 13-14, 1899		55	56	44	58		213	53
Shiawassee	Owosso	Jan. 29-30, 1900	80	175	250	175	375		1,055	211
St. Clair	Yale	Jan. 23-24, 1900	234	462	584	406	534	620	2,840	473
St. Joseph	Three Rivers	Jan. 11-12, 1900	84	157	350	100	345		1,036	207
Tuscola	Caro	Jan. 26-27, 1900	32	146	78	121	220		597	119
Van Buren	Bangor	Jan. 8-9, 1900	65	200	350	125	340		1,080	216
Washtenaw†	Ann Arbor	Feb. 27-28, 1900		349	590	300	507	570	4,716	471
		March 1-2, 1900	400	385	950	290	375			
Wayne	Belleville	Jan. 19-20, 1900	105	235	250	175	310		1,075	215
Wexford	Sherman	Dec. 6-7, 1899	6	38	10				54	18
Total			4,715	11,222	12,768	8,445	16,530	2,689	55,349	10,550
Averages			78	167	199	130	254	299	838	160

* County one-day institutes.
† State Round-up.

The foregoing table shows a light attendance in the Upper Peninsula and in the northern part of the Lower Peninsula. This is largely accounted for by the high price of lumber, which tempted farmers in those sections to rent their teams to lumber companies and to betake themselves to the lumber camps. Next year the attempt will be made to hold the Institutes at an earlier date in these counties.

The weather during January was in the main fair. In most of the counties the work of the Secretary was, although entirely gratuitous, entirely satisfactory. There were occasional counties in which the Secretaries did not properly advertise the meeting, and the attendance was therefore small.

Two-day County Institutes were held in 64 counties, besides the State Round-up at Ann Arbor. The attendance was, as the table shows, very light in some counties and very good in others. The average attendance per session for the season was 160, as against 158 last year. This is true, although the total attendance this year was but 55,349, as against 70,143 last year. This year no session was held the evening of the second day, except in eight counties, nor were there any Three-day Institutes held.

WOMEN'S SECTIONS.

Women's Sections were held in connection with fifty-eight County Institutes. The very evident desire in many counties to merge these sessions into the regular sessions of the Institute must be recognized. The State has been particularly fortunate in the women who have conducted these sections. The subjects treated are such as to require great wisdom, delicacy and tact on the part of the speaker.

LIST OF INSTITUTES HOLDING WOMEN'S SECTIONS.

[With name of State speaker and attendance.]

County.	Place.	State speaker.	Attendance.
Alcona	Harrisville	Mrs. Mary A. Mayo	132
Allegan	Hopkins' Station	Mrs. Mary A. Mayo	75
Alpena	Flanders	Mrs. Mary A. Mayo	40
Antrim	Atwood	Mrs. Emma A. Campbell	57
Arenac	Maple Ridge	Mrs. Mary A. Mayo	40
Barry	Hastings	Mrs. Ella E. Rockwood	90
Bay	Auburn	Miss Maud R. Keller	51
Benzie	Thompsonville	Mrs. Emma A. Campbell	30
Berrien	Benton Harbor	Mrs. Emma A. Campbell	15
Branch	Coldwater	Mrs. Emma A. Campbell	320
Cass	Cassopolis	Mrs. Irma T. Jones	372
Charlevoix	East Jordan	Mrs. Emma A. Campbell	24
Cheboygan	Cheboygan	Mrs. Ella E. Rockwood	18
Chippewa	Sault Ste. Marie	Mrs. Irma T. Jones	45
Clare	Clare	Mrs. Irma T. Jones	65
Crawford	Grayling	Mrs. Ella E. Rockwood	58
Emmet	Petoskey	Mrs. Emma A. Campbell	40
Genesee	Fenton	Mrs. Irma T. Jones	66
Gladwin	Gladwin	Miss Helen S. Norton	40
Grand Traverse	Traverse City	Mrs. Emma A. Campbell	36
Gratiot	Ithaca	Mrs. Irma T. Jones	175
Hillsdale	Jonesville	Mrs. Ella E. Rockwood	50
Huron	Bad Axe	Mrs. Mary A. Mayo	250
Ingham	Leslie	Miss Helen S. Norton	175
Ionia	Ionia	Mrs. Irma T. Jones	200
Iosco	Tawas City	Mrs. Mary A. Mayo	72
Iron	Iron River	Mrs. Irma T. Jones	14
Isabella	Mt. Pleasant	Mrs. Irma T. Jones	80
Kent	Grand Rapids	Mrs. Ella E. Rockwood	65
Kalkaska	South Boardman	Mrs. Irma T. Jones	35
Lake	Chase	Mrs. Irma T. Jones	38
Lapeer	Lapeer	Mrs. Irma T. Jones	278
Lenawee	Tecumseh	Mrs. Mary A. Mayo	200
Livingston	Howell	Mrs. Emma A. Campbell	300
Macomb	Warren	Mrs. Mary A. Mayo	140
Midland	Midland	Miss Maud R. Keller	32
Montcalm	Edmore	Mrs. Irma T. Jones	66
Monroe	London	Mrs. Emma A. Campbell	60
Muskegon	Muskegon	Mrs. Ella E. Rockwood	30
Manistee	Pomona	Mrs. Emma A. Campbell	58
Mason	Scottville	Mrs. Irma T. Jones	25
Mecosta	Mecosta	Miss Helen S. Norton	37
Ogemaw	West Branch	Mrs. Ella E. Rockwood	13
Osceola	Tustin	Miss Helen S. Norton	41
Oscoda	Mio	Mrs. Ella E. Rockwood	45
Otsego	Gaylord	Mrs. Ella E. Rockwood	110
Ottawa	Coopersville	Mrs. Ella E. Rockwood	108
Saginaw	Freeland	Mrs. Irma T. Jones	175
Sanilac	Brown City	Mrs. Mary A. Mayo	
Schoolcraft	Manistique	Mrs. Irma T. Jones	12
Shiawassee	Owosso	Mrs. Mary A. Mayo	125
St. Clair	Yale	Mrs. Irma T. Jones	
St. Joseph	Three Rivers	Mrs. Irma T. Jones	120
Tuscola	Caro	Miss Helen S. Norton	70
Van Buren	Bangor	Mrs. Mary A. Mayo	90
Washtenaw	Ann Arbor	Mrs. Mary A. Mayo	
Wayne	Belleville	Mrs. Ella E. Rockwood	100
Wexford	Sherman	Mrs. Emma A. Campbell	26

ONE-DAY INSTITUTES.

The law requires that one Two-day Institute shall be held in each county in which there is a regularly organized County Institute Society. As many One-day Institutes were planned as the funds would allow. Usually four One-day Institutes were held in a county, but no county was selected for one-day work in 1899-1900 that had had one-day meetings the year previous, except in the case of Barry, Branch, Cass, Emmet and Ottawa, in which counties a State Speaker was sent, but at the expense of the County Society. A list of the One-day Institutes, with the name of the State Speaker, the County Secretary and the attendance follows in the next table.

LIST OF ONE-DAY INSTITUTES FOR 1899-1900.

[Attendance reported by State speaker.]

County.	State speaker.	Places.	Dates.	County secretary.	Attendance per session. A. M.	P. M.	Eve.	Total.	Average per session.
Alcona	C. D. Smith	Curtis	September 12	L. A. Colwell, Harrisville	27	53	.....	80	40
		Gustin	" 14		38	66	.....	104	52
		Haynes	" 15		14	58	.....	72	36
		Caledonia	" 16		28	101	.....	129	64
For county								385	48
Barry	L. W. Oviatt	Freeport		W. R. Harper, Middleville	108	210	.....	318	159
		Lacey			145	275	.....	420	210
For county								738	184
Bay	Jason Woodman	Pinconning	November 27	Wm. Gaffney, Colfax	45	55	.....	100	50
		Beaver	" 28		39	43	.....	82	41
For county								182	45
Berrien	J. N. Stearns	Bainbridge	January 23	L. A. Stuart, Spinks Corners	150	200	.....	350	175
		Naomi	" 24		65	85	.....	150	75
		Pearl Grange Hall	" 25		60	80	.....	140	70
		Berrien Springs	" 26		100	200	.....	300	150
For county								940	117

Branch	N. K. Potter	Bronson	January 15	E. E. Lewis, Coldwater (Average)	100	225	160	1,940	162
		Gilead	" 16						
		Quincy	" 17						
		Union City	" 18						
For county									
Calhoun	C. C. Lillie	Homer	December 12	Frank Minges, Battle Creek	35	93		128	64
		Tekonsha	" 13		68	99		167	83
		Athens	" 14		73	169		242	121
		Partello	" 15		28	70		98	49
For county								635	79
Cass	C. D. Smith	Edwardsburg		J. B. Harmon, Cassopolis	110	275		385	192
For county								385	192
Charlevoix	Peter Voorheis	Charlevoix	December 4	E. B. Ward, Charlevoix	45	65		110	55
		Bay Shore	" 5		38	45		85	41
		Boyne City	" 7		20	40		60	40
For county								253	42
Delta	E. A. Croman	Escanaba	December 5	James S. Doherty, Escanaba					
For county									
Eaton	J. W. Hutchins	Bellevue	December 19	Geo. A. Perry, Charlotte	185	290	170	645	215
		Brookfield	" 20		76	120		196	98
		Vermontville	" 21		88	195		283	141
		Grand Ledge	" 22		30	88		118	59
For county								1,242	128

LIST OF ONE-DAY INSTITUTES FOR 1899-1900.—*Continued.*

County.	State speaker.	Places.	Dates.	County secretary.	Attendance per session.			Total.	Average per session.
					A. M.	P. M.	Eve.		
Emmet	J. D. Towar	Ely	December 13	E. A. Botsford, Petoskey	44	54	.....	98	49
For county					.....	.....	.....	98	49
Genesee	Peter Voorheis E. A. Croman	Goodrich	February 15	Frank H. Hill, Davison	.....	.....	.....	925	308
For county					.....	.....	.....	925	308
Grand Traverse	Peter Voorheis	Fife Lake Monroe Center	December 8 " 9	E. O. Ladd, Traverse City	50 45	60 60	 100	110 205	55 68
For county					.....	.....	.....	315	41
Gratiot	A. M. Welch	Breckenridge Bethany Elm Hall	December 12 " 13 " 14	Wallace M. Comstock, Ithaca	25 40 50	40 60 75	....	65 100 125	32 50 62
For county					.....	.....	.....	290	48
Hillsdale	A. M. Welch	Allen Montgomery Frontier	December 5 " 6 " 7	Earl H. Dresser, Litchfield	20 60 65	60 150 150	..... 200	80 410 215	40 136 107
For county					.....	.....	.....	705	94
Huron	L. W. Oviatt	Pigeon Dwight Pt. Hope Harbor Beach	December 19 " 20 " 21 " 22	Mrs. Geo. Pangman, Verona Mills	 120	120 120 150 180	..... 230 225	120 350 150 525	120 175 150 175
For county					.....	.....	.....	1,145	155

Ingham	C. C. Lillie	Onondaga	December 5	Harvey M. Young, Mason	35	62	.....	97	48
		Dansville	" 6		62	122	.....	184	92
		Holt	" 7		55	70	.....	125	62
		Mason	" 8		65	155	.....	220	110
For county					.....	.....	.....	626	78
Isabella	J. W. Hutchins	Leaton	December 5	M. E. Kane, Mt. Pleasant	.....	70	.....	70	70
		Brinton	" 6		28	52	.....	80	40
		Blanchard	" 7		32	80	.....	112	56
		Dushville	" 8		25	34	.....	59	29
For county					.....	.....	.....	321	49
Iosco	C. D. Smith	Tawas City	September 4	Len. J. Patterson, Tawas City	.....	350	.....	.....	.....
For county					.....	.....	.....	.....	.....
Jackson	C. D. Smith	Springport	February 14	A. S. Wolcott, Concord	115	250	.....	365	182
		Hanover	" 22		125	300	.....	425	212
For county					.....	.....	.....	790	197
Kalkaska	I. N. Cowdrey	North Excelsior	December 7	William T. Hayward, South Boardman	18	25	40	83	28
		Barker Creek	" 8		20	36	37	93	31
For county					.....	.....	.....	176	29
Livingston	Peter Voorheis	Fowlerville	January 23	H. E. Reed, Howell	60	115	.....	175	87
		Pinckney	" 24		65	350	.....	415	207
		Brighton	" 25		152	253	.....	405	202
For county					.....	.....	.....	995	165

LIST OF ONE-DAY INSTITUTES FOR 1899-1900.—*Concluded.*

County.	State speaker.	Places.	Dates.	County secretary.	Attendance per session.			Total.	Average per session.
					A. M.	P. M.	Eve.		
Manistee	I. N. Cowdrey	Manistee	December 4	J. H. Read, Pomona	.....	13	.....	13	13
		Pleasanton	" 5		43	50	.....	93	47
		Yates	" 6		25	40	.....	65	32
For county								171	31
Mason	I. N. Cowdrey	Freesoil	December 12	S. A. Louden, Scottville	23	.....	.....	23	23
		Riverton	" 13		22	37	.....	59	28
		Ludington	" 14		.....	.....	.....	.....	.....
For county								82	25
Midland	L. W. Oviatt	Midland	December 18	J. H. Johnson, Laporte	.....	.....	.....	.....	.....
For county								.....	.....
Montcalm	J. W. Hutchins	Crystal	November 21	A. N. Demoray, Edmore	20	42	.....	62	31
		Carson City	" 22		25	53	.....	78	39
		Greenville	" 23		30	66	.....	96	48
For county								236	39
Muskegon	J. W. Hutchins	Holton	November 24	J. H. Whitney, Muskegon Heights	66	115	.....	181	90
For county								181	90
Newaygo	I. N. Cowdrey	Fremont	December 15	W. C. Stuart, Fremont	45	67	.....	112	56
		Ashland	" 16		74	110	.....	184	92
For county								296	74

Oakland	A. M. Welch	Ortonville	January	9	Fred B. Giddings, Pontiac	150	350	350	850	283
		Davisburg	"	10		60	200	150	410	136
		Wixom	"	11		125	250	.....	375	187
		Royal Oak	"	12		125	250	.....	375	187
For county									2,010	198
Ottawa	J. W. Hutchins	Zeeland	December	14	Fred Luther, Lamont	45	48	.....	93	46
For county									93	46
St. Clair	A. E. Palmer	Memphis	January	10	James Dunn, Emmett	110	276	347	733	244
		Columbus	"	11		74	105	.....	179	89
		Emmett				127	316	412	855	285
For county									1,767	206
Van Buren	Roland Morrill	Covert	January	3	Stephen Doyle, Hartford	150	250	.....	400	200
	C. C. Lillie	Bloomingdale	"	4		205	278	.....	483	241
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